COMPUTERIZED EVALUATIONS OF THE RELATIVE ABILITIES OF PARAMETRIC METHODS TO CORRELATE AND EXTRAPOLATE LONG-TIME CREEP-RUPTURE DATA

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Approved

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This thesis is dedicated to my parents for their assistance and encouragement through the years of academic trials, and to the Creator whose blessings have made my efforts rewarding.

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SUMMARY

Computer programs were developed to optimize the correlation of creep-rupture data by Larson-Miller, Manson-Haferd, Sherby-Goldhoff, Manson-Succop, and Sherby-Dorn methods: the standard deviation of regression was reduced to a minimum when master curves were approximated by first, second, and third order polynomials by determining preferred values of the applicable constants. Other computer programs were developed to give the optimum degree of correlation, by minimizing values of the standard deviation of regression, when utilizing the linear Conrad and Korchynsky methods: for these methods it is necessary to optimize the value of the constant considered in each relationship, and to develop the preferred form of the individual temperature dependent terms.

When all of the data of a given set of stress-rupture results were considered (129 data sets were used), and when computer calculated values of standard deviation of regression, average deviation of stress, average deviation of rupture-time, square root of adjusted mean square, and square root of mean square error were compared, it was generally found that superior correlations were given by the Sherby-Goldhoff and Manson-Haferd methods, and inferior correlations resulted from Conrad and Korchynsky methods.

For extrapolation interior to master curves, it is recommended that the Conrad and Korchynsky methods not be used. The Sherby-Dorn

technique is superior when master curves are approximated by second order polynomials, and the Sherby-Goldhoff method is superior for third order polynomial approximations to master curves.

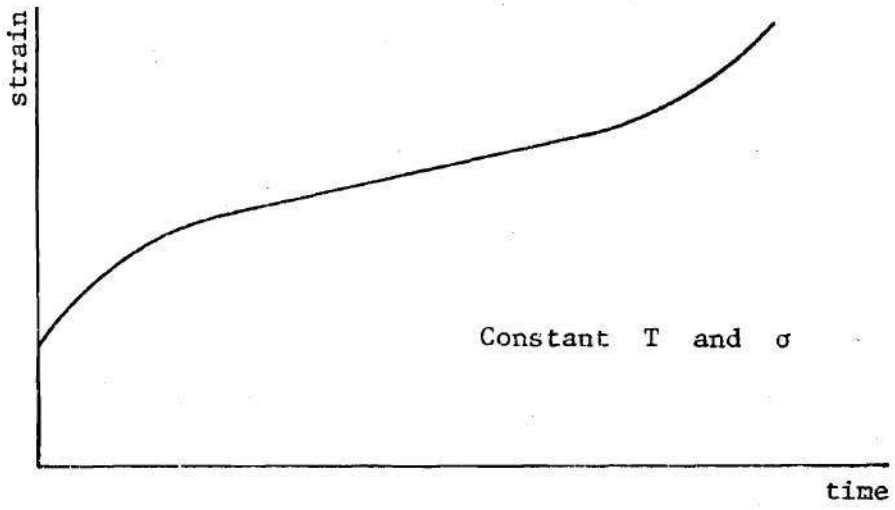
The whole subject of extrapolations exterior to master curves is one which must be approached with extreme caution, regardless of the correlation-extrapolation techniques being utilized. No use should be made of Conrad and Korchynsky methods, and the use of third order polynomial approximations to master curves must be avoided.

CHAPTER I

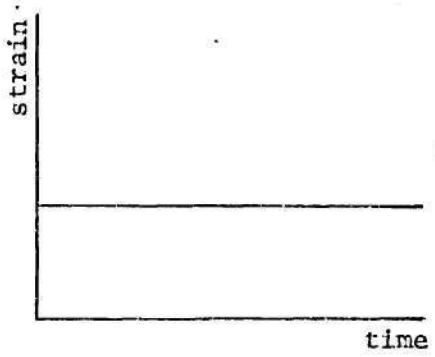
INTRODUCTION

The Creep-Rupture Curve

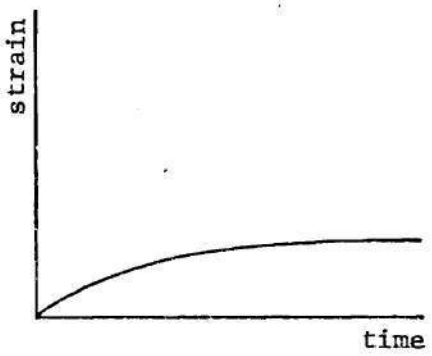
If a metal or alloy sample in the form of a prismatic tensile test specimen is subjected to a sufficiently high combination of axial, longitudinal, load (and hence engineering stress) and temperature, the sample will then deform and eventually fracture. If the longitudinal strain is measured as a function of time during the duration of the test, a plot of the type schematically indicated by Figure 1 will be obtainable. Deformation during the test is referred to as "creep", and the fracture is generally called "rupture". Of particular importance on such a plot is the time-to-rupture and the region of minimum slope, corresponding to the minimum-creep-rate. If the temperature of testing or stress is increased the minimum-creep-rate will be increased, while temperature and/or stress decreases result in decreased minimum-creep-rates and extended times-to-rupture. With metallurgically complicated alloys the minimum-creep-rate may extend over short time durations, as compared with rupture-time, and in some extreme cases it may shrink to an inflection point. For many evaluations only the time-to-rupture is measured, with no attention being paid to strain, and then the test is designated as being a "stress-rupture" test. This thesis is entirely concerned with stress-rupture test results, although the developed techniques will be equally applicable for the consideration of



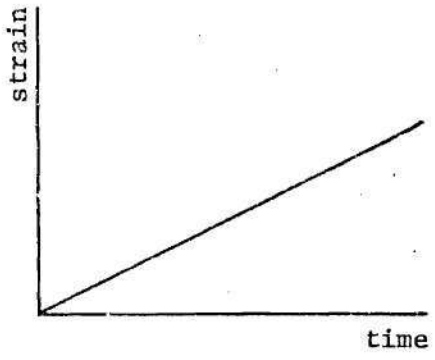
(a). The entire creep-rupture curve.



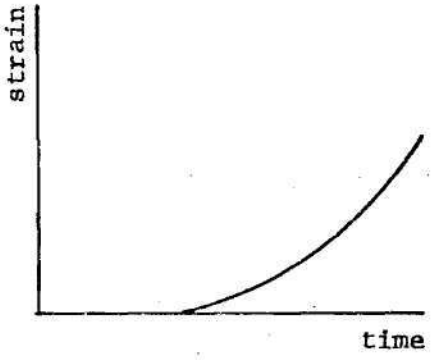
(b). Loading deformation.



(c). Transient creep.



(d). Steady state creep.



(e). Tertiary creep.

Figure 1. Schematic Representation of the Creep-Rupture Curve and Its Various Components.

minimum-creep-rate results. There are many more stress-rupture tests done than there are creep-rupture tests, resulting in a wealth of rupture-time data as compared with minimum-creep-rate data.

It has been mentioned that during the common, engineering, creep-rupture test that a constant load is applied to the specimen: this is done isothermally, at constant temperature. In a number of more basic or fundamentally oriented research investigations specially designed creep-rupture test units have been utilized: an objective has been to obtain constant true stress at least through or well into the minimum-creep-rate region. Methods of creep-rupture testing have been reviewed in detail by Sully [1]* who is an acknowledged authority in the field. Many of the general features of creep-rupture testing are covered in A. S. T. M. Specification E319-58T. There are now several domestic and foreign manufacturers and suppliers of creep-rupture test units, but it is common to find that many organizations have designed and built their own. Although the measurement of creep characteristics is quite simple in theory, in practice it requires a great deal of laboratory equipment and considerable instrumentation and/or manpower [2,3] since there is usually only one test specimen in each testing unit at a given time, and since the elapsed time of such tests often extends to several months and in a few instances tests have been continued for more than 10 years, approaching 100,000 hours.

The creep-rupture curve which is schematically represented by Figure 1(a) may be separated into several components. There is an

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*Numbers in [ ] refer to references listed in the Bibliography.

instantaneous deformation or strain, Figure 1(b), which is not time dependent, and hence is not associated with creep, which is involved with the rapid initial deformation resulting from elastic and plastic straining on loading. Immediatelly following the initial loading is creep characterized by a rate which diminishes with time, Figure 1(c), commonly referred to as "first stage", "primary", or "transient" creep. Andrade's pioneer work has had great influence on all subsequent thinking having to do with primary creep. Transient or primary creep has been demonstrated to be found at temperatures approaching the absolute zero, if stress levels are sufficiently high. Figure 1(d) indicates a component of the creep-rupture curve which is characterized by constant slope, and this is referred to as "steady state", "viscous", or second stage creep. After metallurgical damage has been done, as with the opening of voids or the commencing of grain boundary sliding, for example, a period of "tertiary" or third stage creep is entered and this culminates in rupture, as indicated by Figure 1(e).

Technical literature dealing with test results and the phenomenological, design, and metallurgical interpretations of creep-rupture evaluations is voluminous and the development of applicable theory has been rapid, particularly within the last ten years. Many symposia dealing with aspects of the subject have been held, and their frequency is now at time intervals of less than one year: the symposia are often international in nature.

Presentation of Stress-Rupture Data

When either the creep, creep-rupture, or stress-rupture

characteristics of a particular alloy, in a particular metallurgical condition, are to be determined, it is common practice to complete a number of tests, not just one. The alloy will be tested at several temperatures within the range for which the alloy was designed to serve, which of course includes the range of temperatures which the design engineer is confronted with when considering the selection of an alloy for his application. Several different stress levels will be utilized, in general, at each different temperature of test. The result will be a collection or set of data for each alloy, for each metallurgical condition for which the alloy is likely to be utilized (cold worked, solution treated, precipitation treated, quenched and tempered, etc). It is common to find that both alloy manufacturers and suppliers (as the United States Steel Corporation, International Nickel Company, Aluminum Company of America, etc) and engineering manufacturing companies which are alloy users (as Pratt & Whitney Aircraft, the General Electric Company, Boeing, etc) do their own creep-rupture testing, the former to advertise their products and stimulate sales-promotion while giving design data, and the latter to allow evaluations for their particular applications.

Test results of an alloy evaluation program, including several temperatures and several stress levels at each temperature, are sometimes presented in tabular form, and a typical set of data is given in Table 1: the data of Table 1 is of commercially pure aluminum [4,5]. It is also common engineering practice to present a set of stress-rupture test results by graphical means, with the logarithm of stress

Table 1. Stress-Rupture Data for Commercially Pure Aluminum.

Temperature, °F	Stress, psi	Rupture Time, hours
212	44,350	0.50
212	42,340	2.00
212	38,980	91.0
212	36,960	1,173
212	35,620	2,563
212	33,600	7,202
302	33,600	18.0
302	29,120	171
302	25,540	784
302	22,400	1,726
302	20,160	3,486
392	22,400	1.75
392	15,680	171
392	13,440	1,030
392	11,200	2,114
392	8,960	4,653
482	13,220	2.25
482	10,080	89.0
482	8,960	114
482	7,840	166
482	6,720	354
482	4,480	1,344

σ being plotted as the ordinate against the logarithm of the rupture-time t_r as the abscissa. When data is so plotted, it is often found that relatively straight lines can be drawn through those data points obtained at each of the different test temperatures. However, it is also common to find that there are abrupt discontinuities (abrupt changes of slope) when the data is so plotted. The points at which these abrupt changes occur have been designated under the misleading nomenclauure "equicohesive temperature", corresponding to some physical change of the alloy during the course of creep-rupture testing.

The stress-rupture test results included in Table 1 have been

plotted by conventional methods in Figure 2. For this material (commercially pure aluminum) the abrupt changes of slope of each isothermal line correspond to a chamge of fracture mode from transgranular (through the grains) at low values of rupture-time to intergranular (through the grain boundaries) at higher values of rupture-time. "Equicohesive temperatures" are often associated with changes of fracture mode.

High-Temperature Design Concepts

Data obtained in the creep-rupture laboratory will eventually be used by engineers at the design stage. Concerning the approach, one design concept will concentrate on minimum-creep-rate values, the mechanism or component being designed thus being expected to stay within some deformation limit during its service life. More commonly, however, attention is paid by the design engineer to rupture-times, with appropriate factors of safety being applied. Creep design has not actually reached the degree of development of the theory of elasticity, or even of the theory of mathematical plasticity, but sound analytical approaches are now available and are well documented. Two standard references are the recent books by Finnie and Heller [6] and Hult [7].

At the design stage the engineer would be confronted by a state of quandry if all stress-rupture test results were in the tabular form of Table 1 or the graphical form indicated by Figure 2. The structure, machine, mechanism, or component which is being considered, even if as small as a compressor blade of an aircraft gas turbine, will see service over a range of temperatures and stress levels, not just at a few

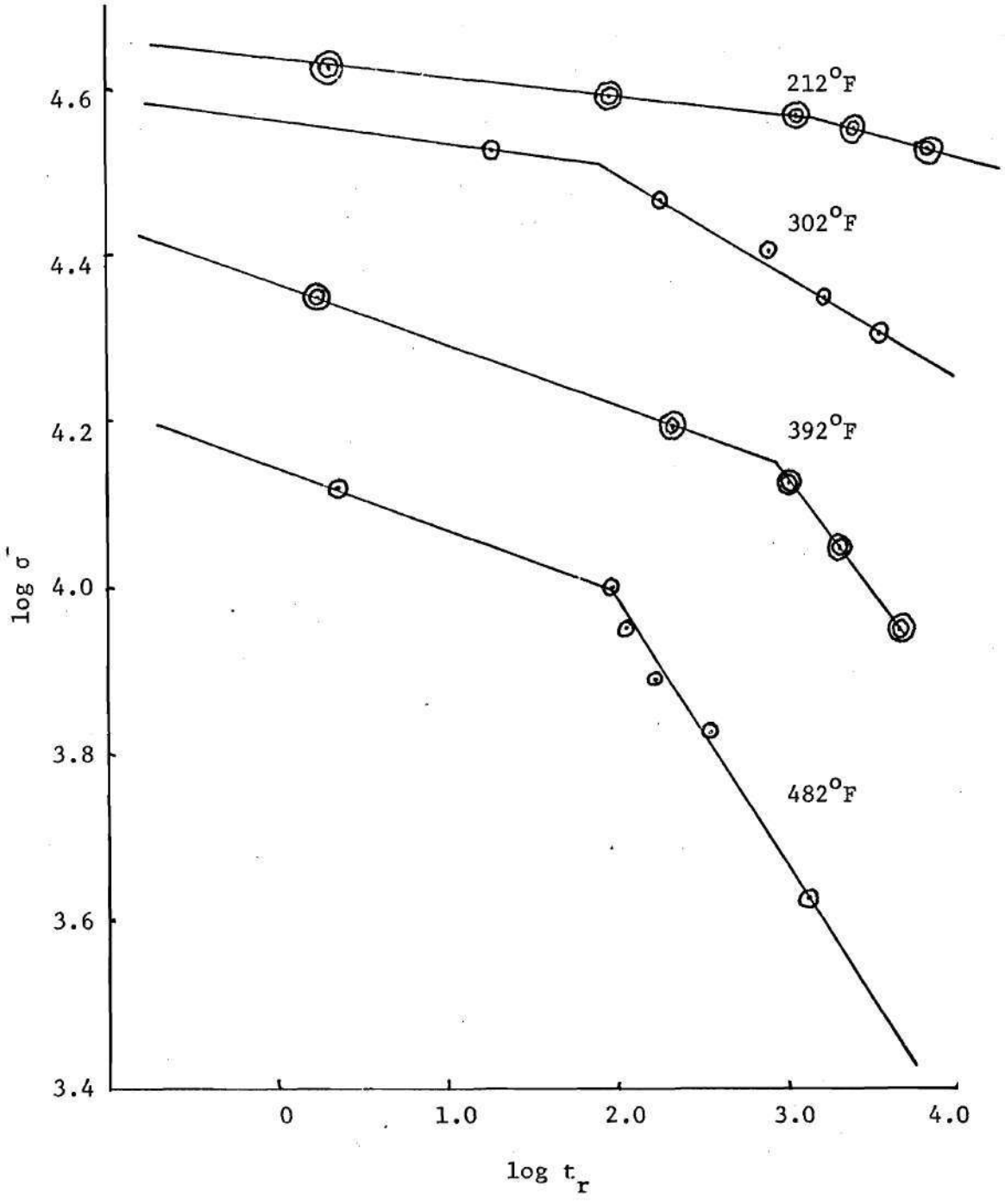


Figure 2. Stress-Rupture Results for Commercially Pure Aluminum.

isolated temperatures and stresses, but the only available test results will be at just a few specified conditions. There is an even more perplexing problem: the component being designed will be expected to give reliable service over some finite life, with 10,000 hours being a common goal for aircraft applications and either 20 years or 100,000 hours being considered as appropriate for steam power plant components. Unfortunately, experimental stress-rupture test data in almost invariably available for only fractions of the expected service life. Thus, the design engineer is faced with either interpolation or extrapolation problems as regards rupture-times. Data in tabular form, or in the form presented in Figure 2, is not amenable to either temperature interpolation or rupture-time extrapolation: in the latter case, one of the points corresponding to an abrupt change of slope (equicohesive temperature) could be easily bypassed or ignored, particularly in an extrapolation to much longer rupture-times, and then the extrapolated results would have no accuracy or applicability to design and would be far from the real situation.

Parametric Correlation of Data

Involved in a plot of stress-rupture data as indicated by Figure 2 are three variables - test temperature, stress, and time-to-rupture. As indicated by Figure 2 and as previously mentioned, some type of line (perhaps discontinuous) can be put on the diagram for each set of isothermal data.

It has long been realized that many of the great complications involved with the utilization of a diagram of the type indicated by

Figure 2 would be reduced if it would be possible to have all of the data points lie along one line, instead of along individual isothermal lines. In order to have this occur it would be necessary to incorporate the three variables into the two quantities to be plotted as the ordinate and the abscissa. As will presently be shown, several schemes to allow the correlation of one set of stress-rupture data into one single line have been developed: in fact, the number of proposed schemes is now of the order of forty, but only three have received much attention in the technical literature and are actually utilized to any extent in engineering practice.

The most common scheme of stress-rupture data correlation involves replacing the abscissa (log t_r of Figure 2) with a parameter which is a function of both temperature and time-to-rupture. If the proper functional relationship could be found, then all test results would lie along one line within limitations imposed by the actual scatter of the experimental test results. The various functional relationships which have appeared in the literature include several which are purely empirical in nature. In some cases the functional relationships (parametric terms) have been "derived" by considerations of phenomenological theory, such as chemical reaction-rate theory. In a few instances basic dislocation theory models have been developed which can be mathematically treated, leading to the "derivation" of parametric terms.

If the proper functional relationship of the mentioned type could be found, so that the ordinate would be a function of stress while the abscissa was a function of both temperature and time-to-

rupture, thus giving one single curve for the analogy to Figure 2, then temperature interpolation and extrapolation by the design engineer would be a relatively simple matter. Also, extrapolation to longer rupture-times would possibly be simplified, since the extrapolation of only one curve would be involved.

Another scheme of data correlation involves replacing the ordinate (log σ of Figure 2) with a parametric term which is a function of both stress and temperature, while the abscissa would be yet another parametric term - a function of both temperature and time-to-rupture.

The inevitable question would be asked as to whether it should actually be possible to exactly correlate data (for a given alloy in a given condition) involving the three variables (stress, temperature, time-to-rupture) into a single curve. If it is indeed possible to do so, then it is only fair to say that the required parameters have not been determined as yet, and thus all which have been developed involve some degree of approximation, or some degree of scatter about the "best" line that can be drawn on the parametric plot.

Statement of the Problem

For this thesis a total of at least 100 sets of stress-rupture data would be obtained from the technical literature, from industry, from governmental laboratories and agencies, etc, etc. The data would be for cobalt, nickel, and aluminum alloys and also for ferritic and austenitic steels since these five classes of materials represent the great majority of alloys which are utilized when creep is the overwhelming design consideration. The data would be correlated by several

different parametric methods. Computer programs would be written to allow evaluations of the relative abilities of the considered parametric methods to actually correlate the data, while using common statistical approaches as the standard deviation. In each case the computer programs would evaluate the optimum constants or temperature dependent terms of each parameter so that each parameter would be evaluated under best conditions. Similarly, the relative abilities of the parametric terms to extrapolate to longer rupture-times would also be determined.

The proposed program is unique as regards the number of data sets to be used, unique by more than an order of magnitude, and as regards the different parameters to be considered: several of the considered parametric formulations have had no comprehensive evaluations. Two of the parametric terms have been modified or altered, hopefully to give improved correlation abilities, and the changes are original with this thesis. All computer programs may be considered as original or, in some cases, as advanced modifications of previous programs. The selection of parametric terms to be considered in the thesis will be covered in Chapter 2.

CHAPTER II

CONSIDERED PARAMETRIC METHODS

Larson-Miller Method

Probably the oldest and certainly the most widely used parametric method is that developed by F. R. Larson and J. Miller, then research engineers with the Watertown Arsenal Laboratories of the United States Army, and described in a technical paper [8] published in 1952. The parametric term has the form:

$$P = (T + 460)(\log t_r + C) \tag{1}$$

where: T = temperature, ^{o}F

t_r = time-to-rupture, hours

C = a materials constant

The "derivation" of Equation 1 was based on basic chemical reaction-rate theory, influenced by the fact that several investigators had shown that plastic deformation [9,10,11], tempering [12], and diffusion [13] appeared to obey rate-process theory. In the original paper C was considered to have a unique value of 20, but it has been found that the degree of correlation is improved if C is evaluated for each set of creep-rupture data. It is an easy matter to show that if experimental data could be exactly correlated by the Larson-Miller methods, that it would be necessary for isostress lines on a plot of $\log t_r$ against reciprocal absolute temperature as the abscissa to be straight

and converge at a point on the ordinate axis, as indicated by Figure 3(a), thus evaluating C [14,15]. The Larson-Miller method has been widely discussed in the technical literature, moreso than any other parametric method. The final master curve for a particular set of data is obtained by plotting $\log \sigma$ as the ordinate against the parameter of Equation 1 as the abscissa, and then it is usually possible to have a smooth curve come near all the data points.

Some of the results of computer programs developed during the course of this thesis have been included here, for illustrative purposes, as Figure 4. For the data of Table 1, for commercially pure aluminum, the computer evaluated an optimum Larson-Miller constant C value of 21.561, this particular value corresponding to a minimum value of the standard deviation of regression. The computer then evaluated $\log \sigma$ and the Larson-Miller parameter for each individual test result. Note that all of the data points of Figure 4 tend to cluster along a single line, instead of being along four isothermal lines as on Figure 2: the data has been correlated. The computer would pass a best or optimum curve through the points on Figure 4, and in this thesis three such types of curves were considered:

$$\text{First Order: Parameter} = P_o + P_1(\log \sigma) \tag{1a}$$

$$\text{Second Order: Parameter} = P_o + P_1(\log \sigma) + P_2(\log \sigma)^2 \tag{1b}$$

$$\text{Third Order: Parameter} = P_o + P_1(\log \sigma) + P_2(\log \sigma)^2 + P_3(\log \sigma)^3 \tag{1c}$$

During its operation the cumputer would reduce to a minimum the value of the standard deviation of regression for each of the first order,

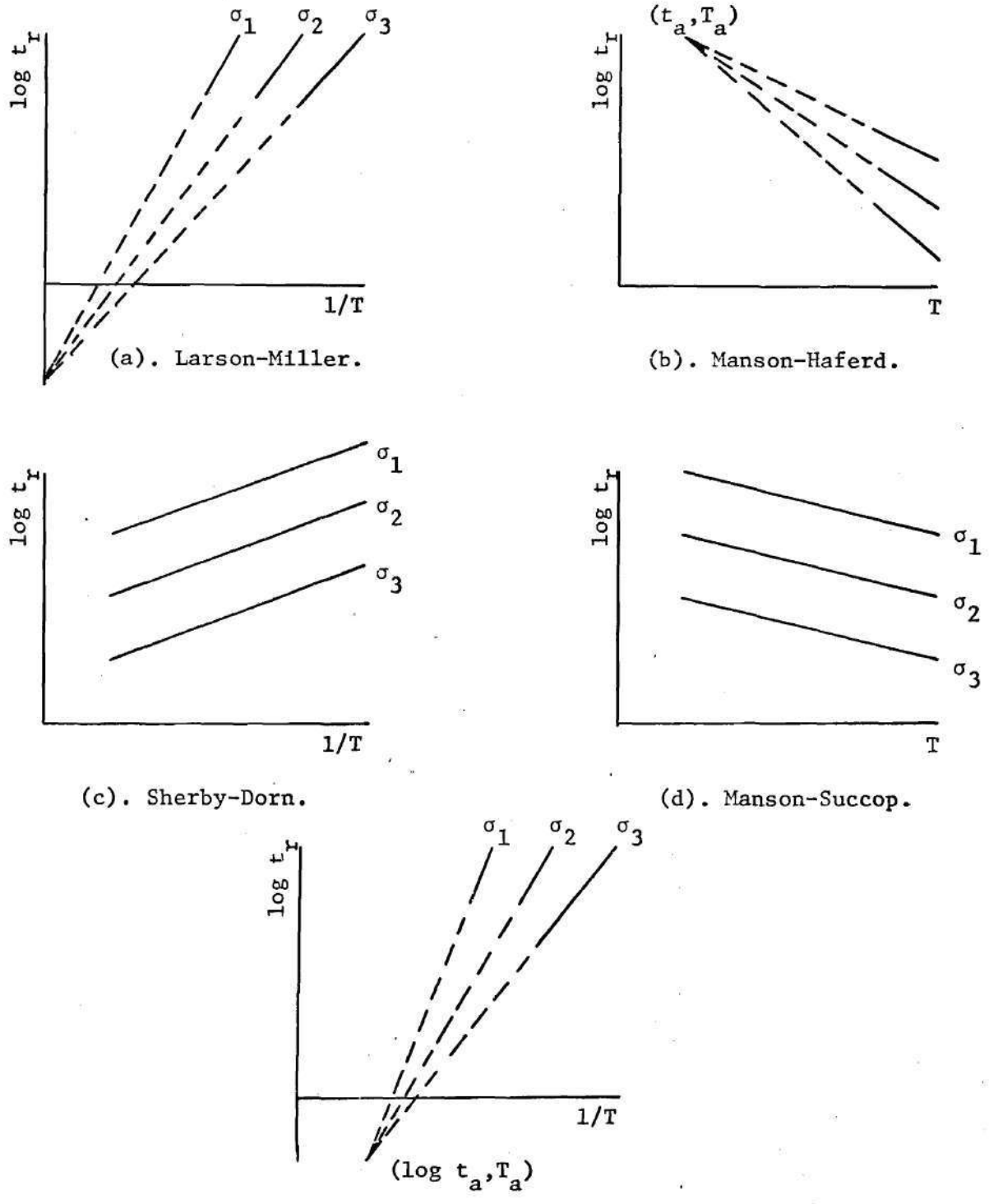


Figure 3. Graphical Requirements of the Five Considered Parametric Methods.

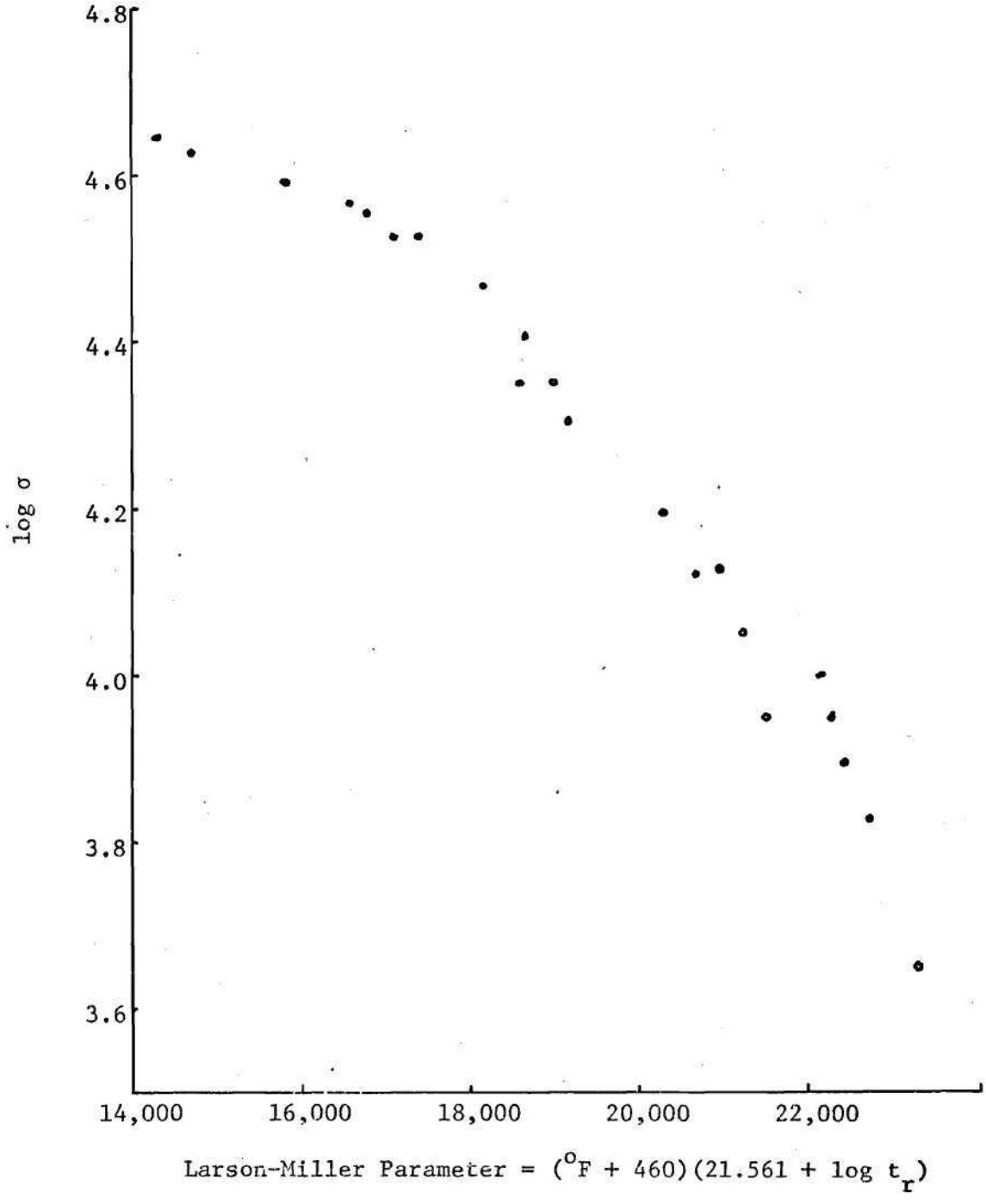


Figure 4. Larson-Miller Master Curve for Commercially Pure Aluminum.

second order, and third order curves, and would evaluate the optimum C value for each case. The previously mentioned optimum C value of 21.561 was determined for a second order curve.

On Figure 4 the data points represented by closed circles are for those rupture-times of less than 1,000 hours, and those represented by open circles have rupture-times in excess of 1,000 hours. The difference between the closed and open circles is of significance as regards extrapolation, as will be discussed in a latter portion of this thesis.

Manson-Haferd Method

When constructing plots such as Figure 3(a), Manson and Haferd found that improved linearity and convergence at a point for isostress lines occurred on plots of $\log t_r$ against temperature, ^{o}F, as indicated by Figure 3(b). Since straight lines converging at a point are involved, the Manson-Haferd method which is completely empirical will involve two constants and will have the form:

$$P = \frac{\log t_r - \log t_a}{T - T_a} \qquad (2)$$

where: T = temperature, ^{o}F

t_r = time-to-rupture, hours

t_a, T_a = material constants

The Manson-Haferd master curve is usually constructed by plotting $\log \sigma$ as the ordinate against the parameter of Equation 2 as the abscissa. Several investigators have considered the results so obtained

to be superior to those resulting from application of the Larson-Miller method for the simple reason that two constants are involved instead of just one.

Sherby-Dorn Method

Dorn generally receives more credit for the development of this method than does Sherby, since Dorn was then the senior and more well known professor, and the method sometimes goes by his name alone. The parameter was developed [17] by working with exactly the same considerations as Larson and Miller: interpretations were different. On Figure 3(a) Sherby and Dorn considered that there was more of a tendency for the isostress lines to be straight and parallel than for having convergence at a point, with the result being as shown by Figure 3(c). The parameter thus has the form:

$$P = t_r \exp \frac{-\Delta H}{RT} \tag{3}$$

where: T = temperature, ^{o}F

R = the universal gas constant

ΔH = the activation energy, a material constant

The value of the activation energy would be proportional to the slopes of the parallel lines of Figure 3(c).

When making a correlation or master plot by this technique it is actually the logarithm of the parameter term (Equation 3) which is plotted as the abscissa against $\log \sigma$ as the ordinate. The activation energy is often interpreted in terms of solid state diffusion.

Manson-Succop Method

This empirical method is a modification of the Manson-Haferd method. When working with their own extensive experimental data obtained with Inconel 700, Manson and Succop found that the lines on Figure 3(c) appeared to be straight and parallel instead of linear and converging, with the result that Figure 3(d) became applicable, for Inconel 700 at least. The resulting parametric term is [18]:

$$P = \log t_r + C\,T \tag{4}$$

where: T = temperature, ^{o}F

C = a material constant

The specific value of C for the alloy being considered is obviously given by the slope of Figure 3(d). For the correlation master plot the parameter of Equation 4 is plotted as the abscissa against $\log \sigma$ as the ordinate.

Goldhoff-Sherby Method

The method is new. A paper describing its application to data has been read but has not been published as yet. Dr. Goldhoff was kind enough to make available the General Electric report [19] on which the oral presentation was based. The method is somewhat similar to that of Larson and Miller in that lines would be straight and converge as with Figure 3(a), but they do not converge along the ordinate line, thus giving Figure 3(e). The resulting parameter is:

$$P = \frac{\log t_r - \log t_a}{1/T - 1/T_a} \tag{5}$$

where: T = temperature, ^{o}F

t_a, T_a = materials constants

For the master plot $\log \sigma$ is plotted as the ordinate against the parameter as the abscissa. There appears to be some question regarding the origin of Equation 5: it was apparently used by Manson in a talk given at the Pennsylvania State University in 1958.

Modified Conrad Method

Conrad's correlation theory is based on considerations of dislocation mechanics, with particular attention being paid to Weertman's [20,21,22] dislocation model for high temperature creep. Conrad's [23] relationship for time-to-rupture has the form:

$$t_r = C_1 \, e^{-\sigma/\sigma_o} e^{\Delta H/RT} \tag{6}$$

where: σ_o = f(T), a temperature dependent term

T = temperature, ^{o}K

R = the universal gas constant

C_1, ΔH = material constants

Note that Conrad's formulation includes a temperature dependent term σ_o, and that a term of this type was not encountered with any of the five previously considered correlation methods. Taking natural logarithms of Equation 6 gives:

$$\ln t_r = C_2 - \sigma/\sigma_o + \Delta H/RT \tag{7}$$

Converting to the common logarithm base of 10:

$$\log t_r = C_3 - \sigma/2.3\sigma_o + \Delta H/2.3RT \tag{8}$$

To allow evaluation of the temperature dependent term σ_o, note that Equation 8 at constant temperature has the form:

$$\log t_r = C_4 - \sigma/2.3\sigma_o \tag{9}$$

Since the formulation for a straight line is of the form $x = y/m + n$, where m is slope and n is the intercept on the x axis, we see that Equation 9 demands that isothermal lines be linear on a plot of σ as the ordinate against $\log t_r$ as the abscissa. A schematic representation of such a plot is given here by Figure 5(a). From this plot we have:

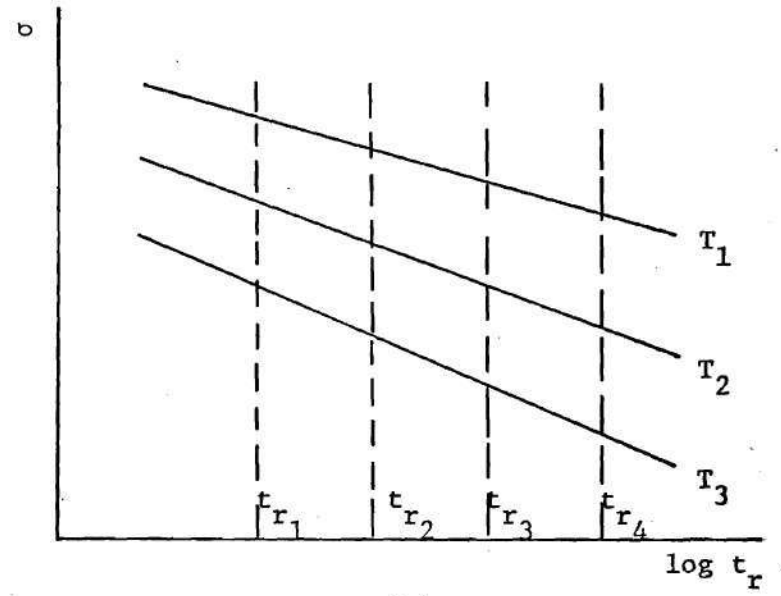
$$\sigma_o = -m/2.3 = -(\text{slope})/2.3 \tag{10}$$

Thus, for each isothermal line, and thus for each temperature, a value of σ_o may be determined from plots of the type of Figure 5(a).

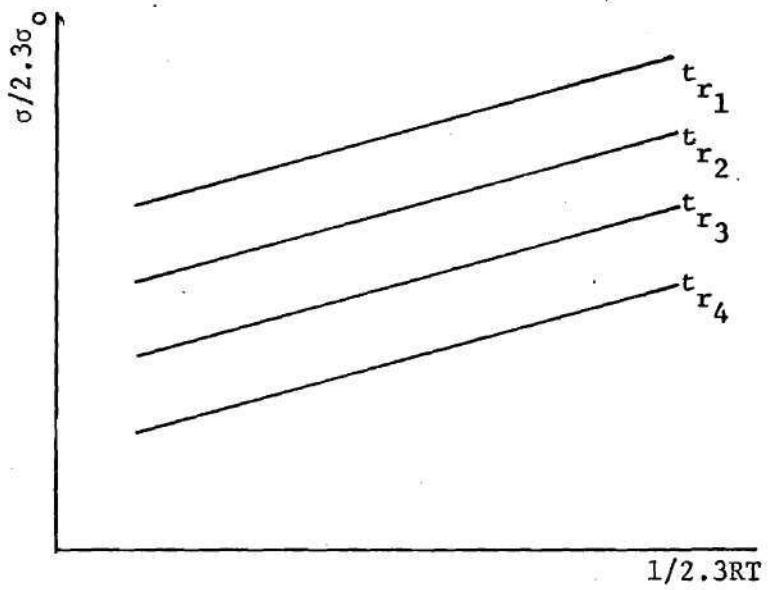
To allow evaluation of the activation energy ΔH, which is intended to be a constant for a given material in a given condition, consider Equation 8 at a constant value of t_r:

$$\sigma/2,3\sigma_o = \Delta H/2.3RT + C_5 \tag{11}$$

We may also represent a straight line formulation as $y = mx + p$,



(a)



(b)

Figure 5. Graphical Basis for Evaluating Terms for Conrad's Equation.

where p is the intercept on the y axis. Now, by use of the previously constructed Figure 5(a) we can make a cross-plot of $(\sigma/2.3\sigma_o)$ as the ordinate against $(1/2.3RT)$ as the abscissa by constructing constant value t_r lines on Figure 5(a). If Conrad's formulation were exactly correct, constant t_r lines on Figure 5(b) should be straight and parallel, and ΔH will then be the value of slope on this plot. Having constructed Figure 5(b) it is then possible to modify or improve the σ_o values at each temperature to values which give exact linearity for Figure 5(b).

The Conrad master or correlation plot is made after considering Equation 8 in the form:

$$\sigma/2.3\sigma_o = (\Delta H/2.3RT - \log t_r) + C_2/2.3 \qquad (12)$$

If the term on the left side of this equation is plotted as the ordinate against the term in brackets as the abscissa, then the data correlation should be around a line with a slope of one.

Modified Korchynsky Method

Interestingly enough, Korchynsky actually considered the use of a relationship exactly similar to Conrad's Equation 6, but after reflection he decided to base his proposal on another dislocation model formulation [24]:

$$t_r = A\,\sigma^b\, e^{C/T} \qquad (13)$$

where: b = $f(T)$, a temperature dependent term

A,C = materials constants

T = temperature, ^{o}K

Similar to the case developed by Conrad, Korchynsky's formulation also includes a temperature dependent term. Taking natural logarithms of Equation 13 gives:

$$\ln t_r = a + b \ln \sigma + C/T \tag{14}$$

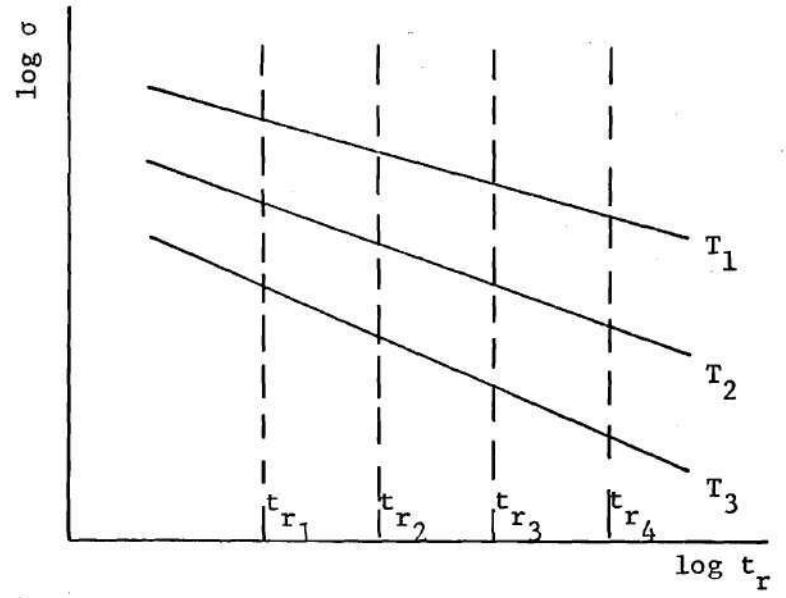
On converting to a common logarithm base of 10 there results:

$$\log t_r = a/2.3 + b \log \sigma + C/2.3T \tag{15}$$

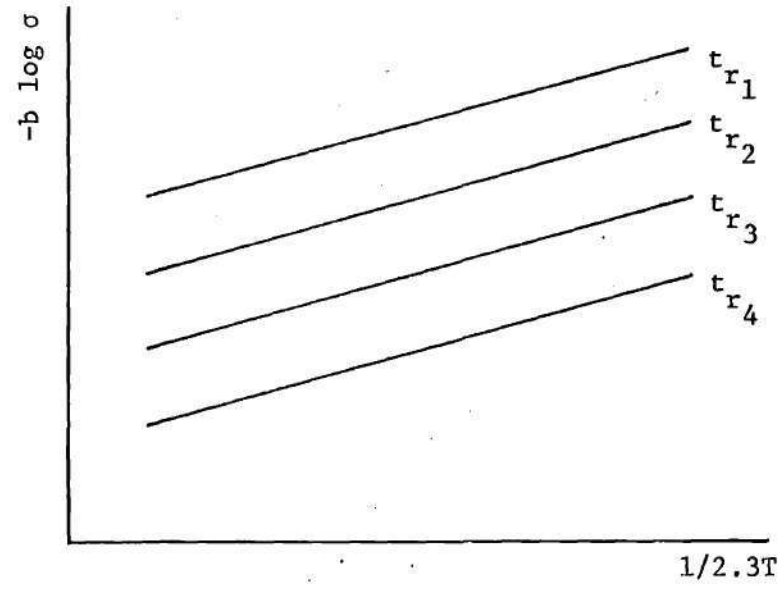
To allow evaluation of the temperature dependent term b, note that Equation 15 at constant temperature is:

$$\log t_r = b \log \sigma + C_1 \tag{16}$$

Since a linear relationship is of the form $x = y/m + n$, where m is slope and n is intercept on the x axis, we see that Equation 16 demands that isothermal lines be linear on a plot of $\log \sigma$ as the ordinate against $\log t_r$ as the abscissa. A schematic representation of such a plot is given here as Figure 6(a). Incidentally, Korchynsky's preference for Equation 13 as compared with Equation 6 was based on his experience that Figure 6(a) is more likely to be linear than is



(a)



(b)

Figure 6. Graphical Basis for Evaluating Terms for Korchynsky's Equation.

Figure 5(a), for the majority of considered stress-rupture data. For the isothermal lines of Figure 6(a) we have:

$$b = 1/m = 1/(\text{slope}) \tag{17}$$

To allow evaluation of the C term, which was intended to be a materials constant, consider Equation 15 at constant values of t_r:

$$-b \log \sigma = C/2.3T + C_2 \tag{18}$$

A straight line formulation is also $y = mx + p$, where p is the intercept on the y axis. By use of the previously constructed Figure 6(a) we can make a cross-plot of $(-b \log \sigma)$ as the ordinate against $(1/2.3T)$ as the abscissa by constructing constant value t_r lines on Figure 6(a), as indicated. If the Korchynsky formulation actually exactly represented the stress-rupture characteristics of a given alloy in a given condition, then the constant t_r lines on Figure 6(b) should be linear and parallel, and C will be valued by the slope of these lines. Having constructed Figure 6(b) it is now possible to modify or improve the b values at each temperature to the values which give exact linearity on Figure 6(b).

The Korchynsky correlation plot is made as a result of considering Equation 15 in the form:

$$(-b \log \sigma) = (C/2.3T - \log t_r) + a/2.3 \tag{19}$$

If the term in brackets on the left side of this relationship is put as the ordinate against the term in brackets on the right side of the equation as the abscissa, then the data obtained by experimentation should cluster around a line with a slope of one.

Comparison of Methods

It is obviously a physical impossibility for the results of a stress-rupture program, for one alloy in one condition, to be consistent with the five requirements of Figure 3 and also Figure 5(a) and Figure 6(a). In fact, the actual data may not give linearity for any one plot, and thus each plot can be regarded as an approximation to the actual physical behavior leading to rupture. The fact that each is an approximation could actually be regarded as one of the very basic considerations of this thesis - which of the various approximations is superior?

In a paper published just one year after the introduction of parametric methods, Manson and Brown [25] treated stress-rupture results obtained with five alloys. They concluded that the use of the Larson-Miller parameter (Equation 1) for the correlation of data and for the prediction of long rupture-times from tests in the short and medium rupture-time ranges might result in appreciable errors. However, it was also concluded that very good correlation was obtained on the basis of the linear time-temperature parameter of Manson and Haferd [16]. In 1956, in the publication [18] in which the Manson-Succop parameter was first introduced, a set of data obtained with Inconel 700 was also analyzed by other parametric methods. It was

concluded that for Inconel 700 the assumptions made by Manson and Haferd (that lines of constant nominal stress are straight on plots of log t_r versus T) agree better with experiment than do the assumptions made by Larson-Miller and Sherby-Dorn. Inconel 700 was considered to represent a special case for the Manson-Haferd parameter (Figure 3b) in that the point of convergence of lines of constant nominal stress was very remote from the data points, and those lines were thus considered to be represented by a parallel family of lines (Figure 3d).

Garofalo, Smith, and Boyle [26] applied experimental results obtained with five steels and the parametric methods of Larson-Miller, Manson-Haferd, and Sherby-Dorn. In checking the validity of the three parameters, it was found that the parameters were not single valued functions of stress over wide ranges of stress, and the actual existence of master curves for these parameters was considered as doubtful.

An engineering paper which received considerable attention was that published by Goldhoff [14] in 1959. Experimental stress-rupture data was given for S-590, A-286, Nimonic 80A, and a 1 Cr - 1 Mo - 1/4 V steel, and the data was treated by the methods of Larson-Miller, Manson-Haferd, and Sherby-Dorn. Optimum values of constants were evaluated by graphical means, as indicated by Figure 3. It was concluded that for general use in extrapolating stress-rupture data the linear parameter of Manson-Haferd was superior to either the Larson-Miller or Sherby-Dorn parameters. Consistently lower values of standard deviations were considered to testify to the greater ability of the linear parameter to correlate the data. Goldhoff also performed a

notable service when he pointed out the advisability of evaluating the constant C in the Larson-Miller parameter (Equation 1) instead of using a "standard" value of 20. Experimental data obtained with several ferritic steels were considered [27] to support the initial conclusions of Goldhoff.

W. Betteridge, the noted British high-temperature alloy designer who holds many patents, considered the extrapolation of stress-rupture properties of Nimonic 80A and Nimonic 90 by the methods of Larson-Miller, Manson-Haferd, Sherby-Dorn, and Graham-Walles [28]: the latter mathod is apparently one used slightly in Great Britain, but little if ever utilized in this country. Examination of the deviations between the longer-time test stresses and the stresses derived from the master curves indicated that for the alloy Nimonic 80A the parameter of Manson-Haferd gave results markedly superior to those obtainable by the other methods. With Nimonic 90 the position was not so clear-cut, but again the Manson-Haferd method gave the best average result.

The mentioned Betteridge paper evidently greatly influenced the thinking of Conrad and led to the first of his papers dealing with a new parametric term. In his 1958-1959 paper published in Great Britain [29], Conrad considered only the data for Nimonic 80A and Nimonic 90 which had been published by Betteridge. Conrad concluded that the ability of his relationship (Equation 12) to predict stresses for rupture-times up to 34,000 hours from test data of less than 3,000 hours duration was good, being comparable to that of the Manson-Haferd parameter and better than that of the Larson-Miller and Sherby-Dorn

methods. The Conrad method was further discussed in another paper [23] in which test results for six alloys were considered. While the paper mostly dealt with physical significances of various terms in the Conrad relationship (Equation 6), it was shown that the Conrad parameter was better able to correlate Inconel X data than was the Larson-Miller parameter.

The paper by Larke and Inglis [15] was significant on several counts: it was one of the first to describe extensive use of computer technology in the treatment of stress-rupture parametric terms. Data for 14 alloys was treated by the methods of Larson-Miller, Sherby-Dorn, and Manson-Haferd. The significance of plots as indicated by Figure 3 was discussed in detail. It was concluded that whichever method of analysis was employed, errors between predicted and actual stress values of $\pm$ 25 percent (based on a confidence limit of 95 percent) must be anticipated, although it was noted that errors around 40 percent were found on occasion.

The recent work of Goldhoff and Hahn [19] greatly influenced this thesis. Involved in the highly computerized program were experimental creep-rupture results obtained with seven alloys and the parametric methods of Larson-Miller, Sherby-Dorn, Manson-Haferd, Manson-Succop, and Sherby-Goldhoff. A large number of conclusions were drawn, but of significance was the finding that the difference in fits between the various parameter methods were relatively small and somewhat inconsistent from one alloy to another. For most alloys slightly poorer results were obtained using the Sherby-Dorn method as compared to other

methods with respect to time-to-rupture, time for one percent creep, and minimum-creep-rate. With respect to time-to-rupture, the Manson-haferd and Sherby-Goldhoff methods tended to give slightly better correlations than the other methods, for the specific alloys which were considered. Superiority of the Manson-Haferd and Sherby-Goldhoff methods to predict long-time time-to-rupture values, from short-time data, was considered to be demonstrated.

CHAPTER III

DATA UTILIZATION

General Considerations

Before the thesis was initiated it was realized that a number of decisions would have to be made concerning the experimental stress-rupture test results to be considered for treatment by the various parametric methods. An initial conclusion was that the only alloys to be considered would be ferritic steels, austenitic steels, nickel alloys, cobalt alloys, and aluminum alloys. These five classes of materials include most of the commercial materials which are utilized in high-temperature structural and mechanical applications, the temperatures being high relative to the liquidus temperatures of the alloys being considered. The initial decision eliminated from consideration several copper alloys and refractory metal alloys for which some good test data is available. However, the mentioned five classes of alloys include those which are of primary importance to the steam-power, nuclear, and aircraft industries.

It was further concluded that the only data which would be considered would be actual experimental results listed in tabular form. Thus, there was eliminated some data which was available only as plots or graphs, as Figure 2: it was reasoned that numerical results could not be taken from the logarithmic plots with sufficient precision to warrent inclusion in the program. Also eliminated were tabular data

for stresses and temperatures for specific rupture-times, as 100, 1,000, or 10,000 hours, since the obtaining of these types of results is dependent on some type of graphical construction, as Figure 2, or the utilization of some type of correlation or extrapolation parameter: actual test data was preferred to data which had allready been treated by some correlation means.

With the exception of cases to be mentioned in a later portion of this chapter, it was decided that the only data to be considered would be that which included a minimum of three different temperatures of testing, with a minimum of four different stress levels at each temperature. It was reasoned that the constants and/or the temperature dependent terms of the seven parametric methods could not be evaluated with any real degree of success unless at least three different test temperatures were involved. The necessity of at least four stress levels at each temperature was of importance so as to include considerations of variations of rupture-times. Preference was given to data which included some long-time test results, so that these long-time data points could be used as extrapolation bases for the comparison of the abilities of the various parametric terms to extrapolate to longer times: an ideal case could be a set of results for a specific alloy in a specific condition, with several rupture-times being in the range of 10-100 hours, 100-1,000 hours, 1,000-10,000 hours, and with a few data points in excess of 10,000 hours, for each temperature of test. It was realized that data of this type is not abundant, and would be difficult to acquire in more than a few instances.

Avoided, when possible, were sets of data which contained obvious inconsistencies. An example of data which contains bad inconsistencies is that of Holdt and Gruen [74] for a chromium-molybdenum-vanadium ferritic steel:

Table 2. Stress-Rupture Data for a Cr-Mo-V Ferritic Steel.

Stress, kg/mm^2	Temperature, °C	Rupture-Time, hours
39.5	550	5.25
24.3	550	1,138
19.5	550	6,754
15.6	550	7,851
15.6	550	12,894
15.5	550	4,812
12.2	550	34,156

The test data obtained at a stress level of 15.5 kg/mm^2 is completely inconsistent with the rest of the test results, as is obvious by visual examination of the table even without constructing a plot of the type of Figure 2. At a given temperature of test, it would be expected that time-to-rupture would increase with decreasing stress level, while the test at 15.5 kg/mm^2 is inconsistent with this trend. It was considered to be unfair to ask computer programs to correlate results when the data itself was inconsistent.

Data Selection

The 129 sets of data which were selected for inclusion in this thesis are identified in Table 3. Listed in the table is a designating code number, a brief description or identification of the alloy, the number of different temperatures included in the experimental stress-rupture program, and the bibliographic references for the data set.

Table 3. Identification of Stress-Rupture Data Sets.

Code	Alloy	Data Points	Temperatures	References	Code	Alloy	Data Points	Temperatures	References
				Austenitic Steels					
1	304	14	3	30	2	304	13	3	30
3	304	17	3	30	4	310	31	4	31
5	316	18	3	30	6	321	18	3	30
7	347	17	3	30	8	347	16	3	30
9	347	15	3	30	10	347	14	3	30
11	HF	14	4	32	12	HH	19	3	32
13	18-8 Ti	34	12	33	14	316	28	5	34,35
15	918B	35	6	36	16	347	45	7	34,35
17	347	45	7	34,35	18	1250	36	8	37
19	A286	24	7	19	20	S590	32	5	14,23
21	A286	55	7	14,23					38,39
				29,38	22	C,4972	92	43	40
23	K,4983	69	36	40	24	326	17	3	30
25	316	15	3	41	26	25 d, 4808	15	3	72
27	25 c,4808	15	4	72	28	22 b, 4541	18	3	72
29	23 b, 4971	15	3	72					
				Ferritic Steels					
1	0.09 C	39	10	33	2	0.10 C	26	4	47
3	0.13 C	28	6	32	4	0.14 C	22	5	42,43
5	2 1/4Cr - 1Mo	47	16	33	6	HGT3	23	4	44
7	12 Cr, H46	23	5	36	8	13Cr-1/2Mo-0.1C	16	3	15
9	SA-210	16	2	45	10	1Cr-1Mo-1/4V	25	5	14
11	1.75Cr - 0.5Mo	32	4	46	12	1 1/4Cr - 1Mo	28	10	19
13	1 1/4Cr-1Mo-1/4V	26	5	19	14	403	16	4	47
15	13Cr-2Ni-3W	19	4	47	16	13Cr-2Ni-3W	24	3	47
17	12Cr-2.75Mo-V	27	5	47	18	12Cr-5Co-3W	19	4	47
19	12Cr-2W-2Mo-V	19	3	47	20	27 Cr	17	3	47
21	P, 30Cr-Mo-V	70	40	40	22	410	14	3	46

Table 3. (Contd.)

Code	Alloy	Data Points	Temperatures	References	Code	Alloy	Data Points	Temperatures	References
23	Croloy 2 1/4	16	5	41	24	Croloy 5	14	3	41
25	Croloy 5	18	5	41	26	Croloy 7	14	3	41
27	5 a	10	2	73	28	7 a	14	2	73
29	8 a	16	2	73	30	12 a	17	2	74
31	14 a	16	2	74	32	16 a	10	2	74
				Aluminum Alloys					
1	2014	49	4	48	2	2018	18	3	48
3	2024	27	3	48	4	2024	36	4	48
5	5083	14	3	48	6	5086	15	3	48
7	5454	18	3	48	8	6061	18	4	48
9	7075	37	4	48	10	Al-1Ni-0.5Fe	32	5	49
11	5454	23	5	50,51	12	5454	16	6	50,51
13	99.5 Al	14	4	4,5	14	Al-2 1/4 Mg	21	4	4,5
15	Al-3 1/2 Mg	21	4	4,5	16	Commercially Pure	22	4	4,5
17	3003	15	4	48	18	5052	13	4	48
19	7075	56	8	48	20	99.5 Al	14	3	52
21	Al-1Mn-0.5Fe	15	3	52	22	Al-2 1/4 Mg	16	4	32
23	5454	23	4	52	24	43	15	4	48
25	195	14	4	48	26	355	14	4	48
				Nickel Alloys					
1	Astroloy	36	5	19	2	Rene 41	39	6	19
3	Inconel 718	28	4	19	4	Udimet 500	42	6	53
5	Inconel 625	15	4	53	6	Udimet 700	22	3	53
7	X750	35	5	54	8	901	26	4	53,63
9	D979	18	5	53	10	Waspaloy	36	8	53,63
11	Inconel 700	62	49	18	12	Hastelloy X	63	10	55,56
13	Nimonic 80A	23	3	14,23 28,29 39,57	14	Nimonic 90	30	5	28,29 57
					15	Nimonic 105	24	4	58

Table 3. (Contd.)

Code	Alloy	Data Points	Temper-atures	Refer-ences	Code	Alloy	Data Points	Temper-atures	Refer-ences
16	M313	41	5	59	17	EPK26	21	5	60
18	IN-100	26	7	61	19	Inconel 713 C	37	5	62
20	Mar M200	37	26	53	21	M22	50	7	59
22	GMR 235D	21	3	53	23	D979	29	6	63
24	Mar M421	38	7	64					
				Cobalt Alloys					
1	Haynes 21	21	5	54	2	Haynes 21	27	3	54
3	Haynes 25	20	5	54	4	S 816	17	4	23,54
5	S 816	37	5	23,38	6	X40	36	6	53
7	X40	49	5	53	8	WI 52	23	3	53
9	Mar M302	21	4	53	10	Mar M322	38	8	65
11	Mar M509a	60	18	66	12	V36	17	4	67
13	Haynes 25	26	5	68	14	Haynes 25	95	7	68,69
15	F387	60	8	70	16	F484	46	10	70
17	Nivco 10	23	5	71	18	Nivco 10	14	5	71

Since it involved some of the longest rupture-times which have ever been experimentally determined, there was a general desire to use the considerable data reported by several German investigators in 1967 [72,73,74]. Unfortunately, the majority of data developed for the involved ferritic and austenitic steels only considered one or two test temperatures, and much of the data contained inconsistencies of the type shown by Table 1. Ten sets of German long-time data were used, however, only for the mentioned reasons, even if only two test temperatures were involved.

When test results were found to be consistent with stated requirements, the data used by other investigators [14,15,18,19,23,25,26,27,28,29] who also attempted to compare different correlation procedures, as mentioned in the last chapter, was used: a total of 18 such data sets were involved, as indicated by Table 3. Almost half of the test data utilized in this thesis (54 data sets) was taken from the various compilations published by the American Society for Testing and Materials [30,31,45,47,48,53,54].

The cooperation extended by various domestic and foreign researchers in making data sets available was very much appreciated. Data obtained by correspondence is listed in the bibliography under the general heading "Personal Communication" [5,35,36,37,41,43,44,46,51,55,58,59,60,62,63,64,66,68,70,71] and these references also appear at pertinent places in Table 3.

CHAPTER IV

COMPUTER PROGRAMS

Parameters Without Temperature Dependent Terms

General Background

The initial basis reference for several of the computer programs developed and modified in this thesis is the 1965 N. A. S. A. Technical Note by Mendelson, Roberts, and Manson [40]. The program, written in Fortran IV, is described in detail in the mentioned reference. Three well known parametric methods were considered, including those of Larson-Miller, Manson-Haferd, and Sherby-Dorn. The 1965 work was a major modification of earlier accomplishments [75] which were considered to be major advances in the practical application of parametric methods: developed was an objective least squares method for determining the optimum values of the parametric constants without plotting and cross-plotting data, as in Figure 3, and without the use of judgment on the part of the analyst. The earlier least squares method involved, however, several practical difficulties that arose from the fact that in fitting the master curve by a polynomial, the set of linear algebraic equations for the coefficients (the normal equations) were ill-conditioned. The determinant of these equations was shown to be related to the Hilbert determinant, which rapidly approaches zero as its order increases. Thus, for polynomials above the second degree, it was necessary to use double precision arithmetic (16 significant digits or

more) on the computer, and for the fifth degree and above the results became uncertain even with double precision arithmetic. This difficulty is inherent in the normal least squares equations and is not limited only to the stress-rupture problem.

The 1965 modification [40] of the 1959 work [75] presented a method for avoiding the above difficulties by using orthogonal polynomials in the representation of the master curve. A further improvement was obtained by performing a linear transformation on the stresses (or the logarithms of the stresses) so that all the values of stress (or log stress) lie between two and minus two. As a result, it became possible to perform all the computations in single precision arithmetic (eight significant digits) up to the 18th degree polynomials without appreciable round-off error. In the Mendelson-Roberts-Manson program, the optimum values of the parametric constants were arrived at, after the computer reduced the "Standard Deviation of Regression" to a minimum value. Consistent with the referenced programs, the "Standard Deviation of Regression" for this thesis is:

$$\left[\frac{\sum_{1}^{n}[\log t_r(\text{observed}) - \log t_r(\text{predicted})]^2}{n - k}\right]^{1/2} \tag{20}$$

where: t_r = time to rupture, hours

n = number of data points

k = the number of constants in the fitted parameter

k = m + 2 for Larson-Miller, Manson-Sussop, Sherby-Goldhoff, Conrad, and Korchynsky parameters

k = m + 3 for Manson-Haferd and Sherby-Goldhoff parameters

m = degree of polynomial used in master curve fitting

The second basic reference for this thesis is the previously mentioned work of Goldhoff and Hahn [19] which in itself is a modification of previous N. A. S. A. [40,75] work. The modified program was also able to handle the Manson-Succop and Sherby-Goldhoff methods. In one set of computer runs all the data of a given set was factored into the fit of the parameter model while in another set of runs only the short-time data was used for this purpose and the long-time data was then used to evaluate the adequacy of the fit. By definition, short-time data for the ferritic steels included in the investigation was considered to be all test results up to 10,000 hours, whereas for the austenitic alloys only the data up to 1,000 hours was so considered. In this thesis the distinction between short- and long-time data was arbitrary, being dependent on the particular data set being considered. The Goldhoff-Hahn computer program also printed-out values of the "Initial Standard Deviation" and the "Prediction Ratio" which are, respectively:

$$\left[\frac{\sum_{1}^{n} [\log t_r(\text{observed}) - \log t_r(\text{predicted})]^2}{n - 1}\right]^{1/2} \tag{21}$$

$$\left|\frac{\log t_r(\text{observed}) - \log t_r(\text{predicted})}{\text{Standard Deviation of Regression}}\right| \tag{22}$$

For this thesis the computer programs were further modified to calculate and print-out the following:

Predicted Stress. The value of stress at the actual value of temperature and rupture-time, given by the fitted parametric curve.

Percentage Deviation of Stress.

$$\left[\frac{\text{Stress(predicted)} - \text{Stress(observed)}}{\text{Stress(observed)}}\right] 100 \tag{23}$$

Percentage Deviation of Rupture-Time.

$$\left[\frac{t_r(\text{predicted}) - t_r(\text{observed})}{t_r(\text{observed})}\right] 100 \tag{24}$$

Average Deviation of Stress.

$$\frac{\sum_{1}^{n} \left|\text{Percentage Deviation of Stress}\right|}{n} \tag{25}$$

Average Deviation of Rupture-Time.

$$\frac{\text{Percentage Deviation of Rupture-Time}}{n} \tag{26}$$

Average Difference (Actual - Predicted).

$$\frac{\sum_{1}^{n} \left[t_r(\text{observed}) - t_r(\text{predicted})\right]}{n} \tag{27}$$

Mean Square Error.

$$\frac{\sum_{1}^{n} [t_r(\text{observed}) - t_r(\text{predicted})]^2}{n} \tag{28}$$

Square Root of the Mean Square Error. The square root of Equation 28.

Adjusted Mean Square.

$$\frac{n}{n-1} [(\text{Mean Square Error}) - (\text{Average Difference})^2] \tag{29}$$

Square Root of Adjusted Mean Square. The square root of Equation 29.

The General Parameter

The general creep-rupture parameter introduced by Manson in 1963 [76] has the following form:

$$P(\sigma) = \frac{\frac{\log t_r}{\sigma^q} - \log t_a}{(T - T_a)^r} \tag{30}$$

where T_a, $\log t_a$, q, and r are material constants to be determined from the available experimental data. The parameter $P(\sigma)$ is a function of stress and, when plotted against stress or the logarithm of stress, gives the master curve (correlation curve). The object is to find the best values of the constants q, $\log t_a$, T_a, and r so that the master curve best fits the data. To find these values, the method of least

squares is used whereby the master curve is represented by a polynomial in the logarithm of the stress, and the best fit is obtained by minimizing the value of the "Standard Deviation of Regression" given by Equation 20. To simplify the notation, the following terms are defined:

$$\tau = \sigma^q (T - T_a)^r \tag{31}$$

$$y = \log t_r \tag{32}$$

$$x = \log \sigma \tag{33}$$

$$y_a = \log t_a \tag{34}$$

Using the newly defined terms of Equations 31, 32, 33, and 34, it follows that Equation 30 can be written as:

$$y = \sigma^q y_a + \tau Q(x) \tag{35}$$

Q(x) can be written in terms of orthogonal polynomials.

$$Q(x) = u_1 Q_1(x) + u_2 Q_2(x) + \ldots + u_{m+1} Q_{m+1}(x) = \sum u_j Q_j(x) \tag{36}$$

where u_j is an unknown constant, m is the degree of the highest degree polynomial, and $Q_j(x)$ is a polynomial of degree (j-1) that satisfies orthogonal conditions. The constants are determined so that Equation 36 fits the experimental data best in the least squares sense: the following term is minimized;

$$S = \sum_{i=1}^{n} [y_i - \sigma_i^q y_a - \tau_i Q(x_i)]^2 \tag{37}$$

Note that the general parameter given by Equation 30 can be reduced to the Larson-Miller, Manson-Haferd, Sherby-Dorn, Manson-Succop, and Sherby-Goldhoff parameters by choosing particular values of q, r, and T_a.

a. For the Larson-Miller parameter, q=0, r=-1, and T_a=-460°F.

b. For the Manson-Haferd parameter, q=0, r=1, and the value of T_a is selected which minimizes the standard deviation. Considered values of T_a included in this program were 38 different values between the limits of -5,000 and +5,000.

c. For the Sherby-Dorn parameter, T_a=0, σ^q=1/T, and r=1.

d. For the Manson-Succop parameter, σ^q=T, r=1, and T_a=0.

e. For the Sherby-Goldhoff parameter, q=0, r=1, and T=1/T. The value of T_a is selected which minimizes the standard deviation. Considered values of T_a included in the program of this thesis were 33 different values between the limits of -0.02 and +0.02.

The complete standard form of the parameter model for the case of a third order polynomial is as follows:

$$P(\sigma) = Q(x) = u_1 + u_2Q_1(x) + u_3Q_2(x) + u_4Q_3(x)$$

$$= u_1 + u_2[(A_1\log\sigma - B_1) - \alpha_1] + u_3\Big[[(A_1\log\sigma - B_1) - \alpha_2]$$
$$[(A_1\log\sigma - B_1) - \alpha_1] - B_2\Big] + u_4\Big[\Big[[A_1\log\sigma - B_1] - \alpha_3\Big]$$
$$\Big[[(A_1\log\sigma - B_1) - \alpha_2][(A_1\log\sigma - B_1) - \alpha_1] - B_2\Big]$$
$$-B_1[(A_1\log\sigma - B_1) - \alpha_1]\Big] \qquad (38)$$

where: σ is applied stress, psi (given information for each of n data points).

A_1, B_1, are standardization constants calculated by the program from the given values of σ.

α_1, α_2, α_3, B_1, B_2, are terms in the orthogonal polynomial calculated from the program from the given values of σ and T.

u_1, u_2, u_3, are values estimated by the method of least squares and calculated by the program.

When the coefficients of $\log \sigma$, $(\log \sigma)^2$, and $(\log \sigma)^3$ are collected, Equation 38 can then be reduced to the following form:

$$P(\sigma) = P_o + P_1 \log \sigma + P_2(\log \sigma)^2 + P_3(\log \sigma)^3 \qquad (39)$$

When $P(\sigma)$, P_o, P_1, P_2, and P_3 are known, then $\log \sigma$ can be determined. For the Sherby-Dorn model it is necessary to use natural logarithms instead of the common, base 10, logarithms. Similarly, and more simply, the complete standard form of the parameter model can be written for second order and first order polynomials.

Parameters With Temperature Dependent Terms

General Considerations

For the case of the five time-temperature parameters without temperature dependent terms there was background material [40,75] involving the use of computers, but for the case being treated in this

portion of the thesis there was practically none. More detailed descriptions will be given here for the modified Conrad method: the modified Korchynsky method is so similar that it will not be described. Orthogonal polynomials and input are described in later sections.

For the Conrad method, for the case of isothermal data, we had developed Equation 9, and this relationship has the linear form of $x = y/m + n$, where m is slope and $-mn$ is the intercept on the y axis. Values of m and $-mn$ are determined by the computer by application of least squares methods, and values of σ_o are then determined for each temperature by the application of Equation 10. For example, let m_1, $-m_1n_1$, σ_{o_1}; m_2, $-m_2n_2$, σ_{o_2}; m_3, $-m_3n_3$, σ_{o_3}; be the values at temperatures T_1, T_2, and T_3, respectively. Then, for the given temperatures T_1, T_2, and T_3 at certain values of the rupture-time, designated as t_{r_1}, σ is determined as follows:

$$\begin{aligned} \sigma_1 &= m_1 \log t_{r_1} - m_1n_1 \quad \text{for } T_1 \\ \sigma_2 &= m_2 \log t_{r_1} - m_2n_2 \quad \text{for } T_2 \\ \sigma_3 &= m_3 \log t_{r_1} - m_3n_3 \quad \text{for } T_3 \end{aligned} \tag{40}$$

At a constant value of rupture-time, as t_{r_1}, it has been shown that the general Conrad relationship of Equation 8 reduces to Equation 11, which is linear with the form $y = mx + p$, where:

$$y = \sigma/2.3\sigma_o$$

$$x = 1/2.3RT$$

$$C = C_5 = \text{intercept with } y \text{ axis}$$

$$m = \Delta H = \text{slope of line}$$

Values of ΔH and C_5 are determined by the application of a least squares method, and other values of ΔH and C_5 are determined for different rupture-times t_{r_2}, t_{r_3}, t_{r_4}, etc. The final value of ΔH is obtained by averaging.

Let C_5^1, C_5^2, C_5^3, and C_5^4 be the intercepts on the y axis for rupture-time values t_{r_1}, t_{r_2}, t_{r_3}, and t_{r_4}. Improved values of σ_o may then be obtained. At temperature T_1 we have:

$$\sigma_{o_1}^1 = \frac{m_1 \log t_{r_1} - m_1 n_1}{2.3[\frac{\Delta H}{2.3RT_1} + C_5^1]} \tag{41}$$

$$\sigma_{o_1}^2 = \frac{m_1 \log t_{r_2} - m_1 n_1}{2.3[\frac{\Delta H}{2.3RT_1} + C_5^2]} \tag{42}$$

$$\sigma_{o_1}^3 = \frac{m_1 \log t_{r_3} - m_1 n_1}{2.3[\frac{\Delta H}{2.3RT_1} + C_5^3]} \tag{43}$$

$$\sigma_{o_1}^4 = \frac{m_1 \log t_{r_4} - m_1 n_1}{2.3[\frac{\Delta H}{2.3RT_1} + C_5^4]} \tag{44}$$

The improved value of σ_{o_1} is the average of the four values of Equations 41, 42, 43, and 44. Similarly, improved values of σ_o are

obtained at other temperatures T_2, T_3, T_4, T_5, etc. As initially pointed out, σ_o is a function of temperature, which can be expressed as follows:

$$\sigma_o = a_o + a_1 T + a_2 T^2 + \ldots + a_m T^m = \sum_{j=1}^{m+1} u_j Q_j(T) \tag{45}$$

In Equation 45 u_j is an unknown constant, m is the degree of the highest order polynomial that is considered, and Q_j is a polynomial of degree j-1 that satisfies the orthogonal conditions to be discussed in a later section. To simplify the notation, the following symbols will be introduced or defined:

$$y = \sigma_o = \sum u_j Q_j(x) = Q(x) \tag{46}$$

$$x = T \tag{47}$$

The constants are determined so that the following equation fits the data best in a least squares sense. In-other-words, the following term is minimized:

$$S = \sum_{i=1}^{n} [y_i - Q(x_i)]^2 \tag{48}$$

To evaluate the constants a number of calculations are made. First, the temperatures are scaled so that they lie in the range from +2 to -2.

$$x = Ax \mp B \tag{49}$$

$$A = \frac{4}{x_{max} - x_{min}} \tag{50}$$

$$B = \frac{2(x_{max} - x_{min})}{(x_{max} - x_{min})} \tag{51}$$

The polynomials $Q_j(x_j)$ are now calculated for each of the n data points by utilization of the following formulations:

$$Q_{j+1} = (x - \alpha_j)Q_j - B_j Q_{j-1} \tag{52}$$

$$\alpha_j = \frac{\sum_{i=1}^{n} x_i \, Q_j^2 \, (x_i)}{\sum_{i=1}^{n} Q_j^2 \, (x_i)} \tag{53}$$

$$B_j = \frac{\sum_{i=1}^{n} x_i Q_j \, (x_i) \, Q_{j-1} \, (x_i)}{\sum_{i=1}^{n} Q_{j-1}^2 \, (x_i)}, \quad Q_1 = 1, \; B_1 = 0 \tag{54}$$

Once the values of Q_j have been computed for each of the temperatures, u_j can be calculated as follows:

$$b_j = \sum_{i=1}^{n} Q_j(x_i) \tag{55}$$

$$c_j = \sum_{i=1}^{n} y_i Q_j(x_i) \tag{56}$$

where $j = 1, 2, 3, \ldots (m+1)$.

Then:

$$u_j = c_j / b_j \tag{57}$$

In regard to Equation 12, with the improved values of σ_o and a value of ΔH ; and with the given values of σ , log t_r , and

temperature T, then the value of C_2 can be calculated by a least squares method. The standard deviation of regression defined by Equation 20 is then evaluated.

Assume that a polynomial relates σ_o to temperature T; the polynomial will be between first order and degree m. The computer program is made to choose a polynomial which gives the smallest value of the standard deviation. For example, if D_1 is the smallest value of the standard deviation, then σ_o may be expressed as a function of temperature in polynomial form. If D_3 is the smallest value of standard deviation, then σ_o can be expressed as a function of temperature by a second degree polynomial.

Orthogonal Polynomials

A set of polynomials $Q_j(x)$ are said to be orthogonal over an interval if they satisfy the following relationship:

$$\int_{x=x_1}^{x=x_2} Q_j(x)\, Q_k(x)\, dx = 0, \quad j \neq k \tag{58}$$

Similarly, a set of polynomials can be defined to be orthogonal over a set of n discrete points by the following relationship:

$$\sum_{i=1}^{n} Q_j(x_i)\, Q_k(x_i) = 0, \quad j \neq k \tag{59}$$

It can be shown [77] that all orthogonal polynomials satisfy a three-term recurrence relationship of the form:

$$Q_{k+1} = (x - \alpha_k)\, Q_k - B_k Q_{k-1}, \quad k \geq 1 \tag{60}$$

Thus, by starting with $Q_1 = 1$ and $B_1 = 0$ an infinite set of orthogonal polynomials can be generated by means of Equation 60 if values for α_k and B_k are known. These can be determined from the orthogonal conditions. From Equation 59 it follows that:

$$\sum_{i=1}^{n} Q_k(x_i)\, Q_{k+1}(x_i) = 0 \tag{61}$$

$$\sum_{i=1}^{n} Q_{k+1}(x_i)\, Q_{k-1}(x_i) = 0 \tag{62}$$

When the recurrence relationship (Equation 60) is used to eliminate Q_{k+1}, there is then obtained:

$$\sum_{i=1}^{n} Q_k[(x_i - \alpha_k)Q_k - B_k Q_{k-1}] = 0 \tag{63}$$

$$\sum_{i=1}^{n} Q_{k-1}[(x_i - \alpha_k)Q_k - B_k Q_{k-1}] = 0 \tag{64}$$

When the orthogonality condition (Equation 59) is used, Equations 63 and 64 reduce to:

$$\sum_{i=1}^{n} (x_i - \alpha_k)Q_k^2 = 0 \tag{65}$$

$$\sum_{i=1}^{n} (x_i Q_k Q_{k-1} - B_k Q_{k-1}^2) = 0 \tag{66}$$

Solving Equations 65 and 66 for α_k and B_k gives:

$$\alpha_k = \frac{\sum_{i=1}^{n} x_i Q_k^2}{\sum_{i=1}^{n} Q_k^2} \tag{67}$$

$$B_k = \frac{\sum_{i=1}^{n} x_i Q_k Q_{k-1}}{\sum_{i=1}^{n} Q_{k-1}^2} \tag{68}$$

Thus, a set of orthogonal polynomials can be generated that are orthogonal over a finite set of discrete values of the variable x.

Least Squares Procedures

Condider the following relationship:

$$y = \sum_{j=1}^{m+1} u_j Q_j(x) \tag{69}$$

To find the best value of u_j to fit the actual data, the sum of the squares of the residuals is minimized. Thus, let:

$$S = \sum_{i=1}^{n} [y_i - \sum_{j=1}^{n} u_j Q_j(x_i)]^2 \tag{70}$$

In order to determine the values of u_j to make S a minimum, S is differentiated with respect to each u_j and the resulting relationships are:

$$b_i u_i + 0 + \ldots + 0 = c_1 \tag{71}$$

$$0 + b_2 u_2 + 0 \ldots + 0 = c_2 \tag{71}$$

$$0 + 0 + \ldots + b_{m+1} u_{m+1} = c_{m+1} \tag{71}$$

where:

$$b_j = \sum_{i=1}^{n} Q_j^2(x_i) \qquad j = 1,2,3, \ldots m+1 \tag{72}$$

$$c_j = \sum_{i=1}^{n} y_i Q_j(x_i) \qquad j = 1,2,3, \ldots m+1 \tag{73}$$

$$u_j = c_j/b_j \tag{74}$$

For the special case when $m = 1$, the slope of the line is u_2, the intercept with the y axis is u_1, and there are the direct formulae:

$$\text{slope} = \frac{n \sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{n \sum_{i=1}^{n} x_i^2 - \left(\sum_{i=1}^{n} x_i \right)^2} \tag{75}$$

$$\text{intercept with } y \text{ axis} = \frac{\sum_{i=1}^{n} y_i - \text{slope} \sum_{i=1}^{n} x_i}{n} \tag{76}$$

Program Input, Correlation

1. Title card - name, designation, or description of the material.
2. Mode card - a card with the following information (KS1):
   a. 0 in column 5 for Conrad method.
   b. 1 in column 5 for Korchynsky method.
3. Data Set 1. Card indicating the highest degree of polynomial investigated for each method (relation of temperature and parameter constant).
4. Data Set 2. Cards with the following information for each test result (all data should include the decimal or be right justified):
   a. In columns 1 to 15, any desired identification information.
   b. In columns 16 to 20, temperature in ^{o}F.
   c. In columns 26 to 30, stress in thousands of psi.

d. In columns 31 to 40, rupture-time in hours.

5. End Card, a card with END in columns 46 to 48.

Program Input, Prediction or Extrapolation

1. Title card - name, designation, or description of the material.

2. Mode card - similar to correlation.

3. Data Set 1 (M). Similar to Data Set 1 for input, type A.

4. Data Set 2 (M). Similar to Data Set 2 for input, type A.

5. End Card, a card with EXT in columns 46 to 48.

CHAPTER V

RESULTS

Space and Page Limitations

With 129 sets of stress-rupture data being involved, and with several different statistical methods for treating results of the individual data sets, the number of different results obtained during the course of the thesis was unusually large. In fact, because of space (page) limitations it has been necessary to omit many results, although they are available on the computer print-outs and in various laboratory notebooks. For example, the optimum values of constants for the Larson-Miller method (Equation 1), Manson-Haferd method (Equation 2), Sherby-Dorn method (Equation 3), Manson-Succop method (Equation 4), and Goldhoff-Sherby method (Equation 5) have not been listed, nor have the values of constants and temperature dependent terms for the modified Conrad method (Equation 12) and the modified Korchynsky method (Equation 19). The omitted terms are of importance only to the data sets considered, and give no indications of the degrees of correlation achieved or the accuracies of the extrapolations obtained. Page limitations have also made necessary the omission of other results, as will be explained.

Correlation of All Data

Standard Deviation of Regression

Values of the standard deviation of regression for each complete

data set are listed in Table 4. Included in Table 4 are values for the Larson-Miller (L-M), Manson-Haferd (M-H), Goldhoff-Sherby (S-G), Manson-Succop (M-S), Sherby-Dorn (S-D), modified Conrad (C), and modified Korchynsky (K) methods. Since the master plots for the first five of these methods may be approximated by first order, second order, and third order polynomials, results have been listed for each order of polynomial with the column headed M indicating the appropriate degree of polynomial. However, the basic nature of the Conrad and Korchynsky master plots dictate that only first order polynomials (linear relationships) be used.

Listed in Table 5 are the average values of standard deviation of regression for each class of alloys, and for all of the data sets, for the case of second order polynomial approximations to appropriate master curves. Table 6 gives the frequency of ranking (number of times giving best correlation, number of times giving second best correlation, etc, etc) of the individual data set values for the case of second order polynomial approximations to appropriate master curves. To repeat, note that modified Conrad and Korchynsky master curves must be represented by first order polynomials. Tables 7 and 8 are similar to Tables 5 and 6, except that third order polynomials are involved instead of second order polynomials.

Average Deviation of Stress

Values of the average deviation of stress, as defined by Equation 25, for each complete data set are listed in Table 9. Listed in Table 10 are the averaged values of average deviation of stress for

each class of alloys and for all the data sets, for the case of second order polynomial approximations to appropriate master curves. Table 11 lists the frequency of ranking, based on second order polynomial approximations. Tables 12 and 13 are similar to Tables 10 and 11, except that third order polynomials are involved.

Average Deviation of Rupture-Time

Values of the average deviation of rupture-time, as defined by Equation 26, for each complete data set are listed in Table 14. Listed in Table 15 are the averaged values of average deviation of rupture-time for each class of alloys, and for all of the data sets, for the case of second order polynomial approximations to appropriate master curves. Table 16 lists the frequency of ranking, based on second order polynomial approximations. Tables 17 and 18 are similar to Tables 15 and 16, except that third order polynomials are involved.

Square Root of Adjusted Mean Square

Averaged values of the square root of the adjusted mean square as given by the square root of Equation 29, are listed in Tables 19 and 21 for each class of alloys, and for all of the data sets, for the cases of second and third order approximations to appropriate master curves, respectively. Tables 20 and 22 list the frequencies of ranking based on second and third order polynomial approximations, as with the previous cases.

Square Root of Mean Square Error

Averaged values of the square root of the mean square error, as given by the square root of Equation 28, are listed in Tables 23 and

Table 4. Standard Deviation of Regression (Equation 20) for Each Complete Data Set.

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1	0.174	0.206	0.134	0.231	0.251	0.129	0.096
	2	0.116	0.132	0.101	0.151	0.101		
	3	0.123	0.108	0.101	0.159	0.100		
2	1	0.224	0.193	0.244	0.202	0.261	0.145	0.174
	2	0.235	0.193	0.226	0.201	0.253		
	3	0.228	0.162	0.204	0.190	0.259		
3	1	0.188	0.104	0.146	0.195	0.262	0.098	0.075
	2	0.163	0.087	0.127	0.136	0.190		
	3	0.167	0.089	0.123	0.141	0.197		
4	1	0.230	0.221	0.232	0.217	0.225	0.351	0.250
	2	0.226	0.220	0.232	0.221	0.228		
	3	0.185	0.181	0.190	0.180	0.185		
5	1	0.247	0.282	0.246	0.271	0.254	0.190	0.220
	2	0.252	0.222	0.207	0.269	0.228		
	3	0.260	0.194	0.190	0.278	0.234		
6	1	0.249	0.222	0.184	0.276	0.317	0.171	0.176
	2	0.176	0.152	0.176	0.193	0.183		
	3	0.140	0.140	0.138	0.161	0.137		
7	1	0.361	0.167	0.211	0.388	0.414	0.143	0.094
	2	0.167	0.130	0.101	0.181	0.222		
	3	0.107	0.112	0.097	0.111	0.124		
8	1	0.213	0.126	0.094	0.237	0.276	0.101	0.083
	2	0.093	0.090	0.090	0.090	0.117		
	3	0.094	0.091	0.093	0.086	0.106		
9	1	0.120	0.141	0.116	0.140	0.159	0.144	0.115
	2	0.117	0.127	0.114	0.130	0.112		
	3	0.120	0.121	0.109	0.136	0.109		
10	1	0.304	0.276	0.269	0.324	0.372	0.285	0.280
	2	0.281	0.284	0.284	0.279	0.305		
	3	0.251	0.258	0.270	0.244	0.255		
11	1	0.338	0.415	0.343	0.395	0.370	0.340	0.354
	2	0.348	0.363	0.344	0.385	0.329		
	3	0.352	0.336	0.343	0.395	0.329		
12	1	0.257	0.245	0.199	0.259	0.207	0.190	0.172
	2	0.253	0.187	0.165	0.267	0.213		
	3	0.258	0.148	0.141	0.273	0.217		
13	1	0.238	0.258	0.205	0.270	0.302	0.099	0.141
	2	0.171	0.157	0.146	0.205	0.146		
	3	0.173	0.105	0.135	0.207	0.141		
14	1	0.205	0.161	0.145	0.231	0.241	0.118	0.134
	2	0.124	0.136	0.125	0.134	0.127		
	3	0.117	0.123	0.116	0.123	0.115		
15	1	0.426	0.274	0.231	0.490	0.575	0.237	0.333
	2	0.212	0.217	0.212	0.210	0.256		
	3	0.208	0.212	0.212	0.210	0.217		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
16	1	0.204	0.180	0.161	0.233	0.296	0.128	0.159
	2	0.146	0.137	0.156	0.138	0.166		
	3	0.145	0.129	0.156	0.136	0.154		
17	1	0.186	0.204	0.173	0.214	0.226	0.189	0.156
	2	0.157	0.160	0.153	0.169	0.152		
	3	0.156	0.152	0.150	0.168	0.147		
18	1	0.519	0.490	0.507	0.517	0.531	0.509	0.734
	2	0.387	0.367	0.401	0.364	0.385		
	3	0.375	0.361	0.381	0.356	0.381		
19	1	0.413	0.290	0.267	0.434	0.429	0.215	0.276
	2	0.258	0.245	0.242	0.258	0.295		
	3	0.209	0.211	0.217	0.205	0.218		
20	1	0.146	0.176	0.138	0.198	0.279	0.159	0.129
	2	0.137	0.134	0.136	0.152	0.139		
	3	0.133	0.135	0.135	0.145	0.142		
21	1	0.415	0.253	0.224	0.420	0.500	0.234	0.268
	2	0.232	0.229	0.206	0.243	0.281		
	3	0.151	0.155	0.154	0.154	0.164		
22	1	0.212	0.254	0.205	0.248	0.301	0.169	0.203
	2	0.202	0.185	0.190	0.229	0.185		
	3	0.203	0.178	0.191	0.230	0.185		
23	1	0.512	0.506	0.437	0.557	0.649	0.102	0.152
	2	0.415	0.432	0.410	0.448	0.416		
	3	0.417	0.411	0.407	0.451	0.403		
24	1	0.397	0.385	0.385	0.385	0.376	0.275	0.444
	2	0.411	0.334	0.346	0.399	0.386		
	3	0.409	0.280	0.298	0.402	0.384		
25	1	0.229	0.258	0.227	0.257	0.260	0.208	0.204
	2	0.217	0.221	0.207	0.229	0.203		
	3	0.225	0.200	0.196	0.238	0.206		
26	1	0.225	0.210	0.195	0.259	0.262	0.249	0.191
	2	0.205	0.210	0.204	0.212	0.221		
	3	0.207	0.214	0.211	0.210	0.220		
27	1	0.347	0.240	0.235	0.382	0.403	0.107	0.140
	2	0.175	0.194	0.162	0.197	0.203		
	3	0.096	0.111	0.099	0.107	0.102		
28	1	0.193	0.147	0.147	0.220	0.230	0.154	0.137
	2	0.142	0.139	0.146	0.142	0.150		
	3	0.121	0.117	0.127	0.116	0.126		
29	1	0.083	0.074	0.079	0.079	0.077	0.148	0.070
	2	0.071	0.071	0.076	0.068	0.071		
	3	0.074	0.075	0.079	0.071	0.074		
				Ferritic Steels				
1	1	0.150	0.156	0.127	0.170	0.195	0.076	0.108
	2	0.111	0.106	0.109	0.123	0.104		
	3	0.112	0.105	0.111	0.124	0.105		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
2	1	0.525	0.316	0.421	0.540	0.589	0.148	0.183
	2	0.166	0.195	0.152	0.194	0.212		
	3	0.140	0.137	0.134	0.163	0.128		
3	1	0.201	0.181	0.187	0.201	0.231	0.184	0.228
	2	0.165	0.156	0.176	0.157	0.164		
	3	0.164	0.158	0.173	0.155	0.168		
4	1	0.172	0.203	0.160	0.200	0.187	0.095	0.136
	2	0.136	0.118	0.101	0.157	0.115		
	3	0.136	0.107	0.095	0.157	0.113		
5	1	0.214	0.214	0.205	0.217	0.273	0.270	0.249
	2	0.204	0.204	0.207	0.205	0.213		
	3	0.202	0.211	0.201	0.199	0.214		
6	1	0.391	0.298	0.315	0.406	0.434	0.173	0.247
	2	0.195	0.196	0.184	0.202	0.226		
	3	0.153	0.156	0.160	0.153	0.157		
7	1	0.313	0.310	0.306	0.320	0.332	0.331	0.475
	2	0.259	0.247	0.240	0.260	0.247		
	3	0.243	0.216	0.208	0.243	0.227		
8	1	0.502	0.437	0.464	0.530	0.532	0.218	0.412
	2	0.245	0.266	0.237	0.272	0.263		
	3	0.211	0.232	0.216	0.224	0.218		
9	1	0.199	0.186	0.188	0.216	0.216	0.169	0.183
	2	0.173	0.179	0.179	0.171	0.171		
	3	0.181	0.186	0.186	0.179	0.179		
10	1	0.566	0.483	0.440	0.575	0.673	0.700	0.772
	2	0.357	0.394	0.357	0.387	0.370		
	3	0.290	0.263	0.249	0.325	0.256		
11	1	0.913	0.814	0.865	0.934	0.944	0.674	0.941
	2	0.549	0.553	0.501	0.585	0.605		
	3	0.427	0.460	0.414	0.458	0.422		
12	1	0.275	0.235	0.199	0.292	0.344	0.070	0.162
	2	0.083	0.083	0.073	0.103	0.711		
	3	0.082	0.066	0.073	0.098	0.068		
13	1	0.374	0.364	0.312	0.405	0.429	0.108	0.265
	2	0.121	0.070	0.077	0.140	0.070		
	3	0.108	0.053	0.078	0.137	0.069		
14	1	0.391	0.285	0.290	0.404	0.454	0.197	0.177
	2	0.195	0.208	0.185	0.203	0.247		
	3	0.184	0.200	0.189	0.198	0.186		
15	1	0.448	0.253	0.275	0.490	0.530	0.145	0.152
	2	0.133	0.143	0.140	0.138	0.158		
	3	0.138	0.142	0.141	0.139	0.149		
16	1	0.560	0.415	0.417	0.543	0.560	0.197	0.365
	2	0.265	0.253	0.259	0.260	0.252		
	3	0.267	0.202	0.235	0.258	0.249		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
17	1	0.718	0.683	0.571	0.789	0.831	0.456	0.609
	2	0.371	0.431	0.358	0.435	0.376		
	3	0.302	0.285	0.263	0.360	0.257		
18	1	0.445	0.339	0.371	0.446	0.488	0.271	0.319
	2	0.305	0.309	0.290	0.313	0.341		
	3	0.251	0.255	0.235	0.267	0.237		
19	1	0.422	0.383	0.414	0.432	0.432	0.200	0.254
	2	0.215	0.229	0.219	0.223	0.218		
	3	0.188	0.158	0.156	0.190	0.297		
20	1	0.266	0.145	0.222	0.296	0.393	0.226	0.154
	2	0.238	0.142	0.147	0.186	0.287		
	3	0.243	0.096	0.118	0.191	0.179		
21	1	0.379	0.316	0.219	0.379	0.526	0.215	0.204
	2	0.193	0.225	0.178	0.226	0.272		
	3	0.136	0.162	0.128	0.203	0.148		
22	1	0.689	0.522	0.644	0.715	0.723	0.196	0.255
	2	0.249	0.231	0.231	0.269	0.306		
	3	0.197	0.204	0.209	0.197	0.194		
23	1	0.266	0.223	0.223	0.284	0.304	0.122	0.094
	2	0.230	0.231	0.228	0.230	0.241		
	3	0.238	0.241	0.238	0.237	0.248		
24	1	0.122	0.120	0.084	0.174	0.183	0.106	0.062
	2	0.076	0.089	0.069	0.096	0.070		
	3	0.069	0.074	0.063	0.082	0.062		
25	1	0.087	0.082	0.093	0.079	0.090	0.073	0.076
	2	0.086	0.079	0.094	0.081	0.089		
	3	0.089	0.081	0.098	0.084	0.091		
26	1	0.181	0.180	0.149	0.187	0.156	0.135	0.129
	2	0.187	0.140	0.132	0.197	0.162		
	3	0.164	0.123	0.118	0.178	0.145		
27	1	0.419	0.279	0.389	0.447	0.447	0.108	0.181
	2	0.240	0.113	0.196	0.273	0.273		
	3	0.251	0.126	0.211	0.282	0.282		
28	1	0.451	0.402	0.412	0.434	0.434	0.253	0.401
	2	0.472	0.312	0.365	0.455	0.455		
	3	0.446	0.308	0.330	0.427	0.427		
29	1	0.347	0.215	0.304	0.373	0.373	0.256	0.167
	2	0.264	0.189	0.236	0.284	0.284		
	3	0.227	0.165	0.205	0.243	0.243		
30	1	0.408	0.397	0.407	0.419	0.419	0.442	0.412
	2	0.410	0.413	0.418	0.416	0.416		
	3	0.403	0.405	0.413	0.408	0.408		
31	1	0.508	0.512	0.514	0.519	0.519	0.343	0.523
	2	0.399	0.392	0.392	0.388	0.388		
	3	0.387	0.336	0.337	0.369	0.369		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
32	1	0.604	0.578	0.610	0.626	0.626	0.418	0.515
	2	0.412	0.451	0.451	0.412	0.412		
	3	0.449	0.497	0.497	0.446	0.446		
				Aluminum Alloys				
1	1	0.764	0.547	0.344	0.781	0.826	0.543	0.670
	2	0.551	0.472	0.291	0.579	0.698		
	3	0.273	0.344	0.244	0.340	0.402		
2	1	0.432	0.379	0.288	0.481	0.503	0.280	0.435
	2	0.211	0.201	0.210	0.227	0.184		
	3	0.211	0.152	0.216	0.230	0.190		
3	1	0.691	0.568	0.595	0.721	0.716	0.564	0.605
	2	0.566	0.579	0.544	0.597	0.576		
	3	0.518	0.500	0.480	0.540	0.491		
4	1	0.776	0.555	0.384	0.777	0.844	1.27	1.45
	2	0.504	0.458	0.244	0.521	0.687		
	3	0.304	0.371	0.157	0.369	0.398		
5	1	0.312	0.253	0.151	0.372	0.421	0.084	0.129
	2	0.095	0.144	0.152	0.139	0.129		
	3	0.094	0.052	0.147	0.132	0.071		
6	1	0.360	0.260	0.192	0.432	0.478	0.130	0.165
	2	0.095	0.122	0.196	0.115	0.145		
	3	0.098	0.101	0.142	0.116	0.122		
7	1	0.293	0.209	0.238	0.368	0.414	0.136	0.178
	2	0.148	0.140	0.247	0.136	0.179		
	3	0.153	0.129	0.251	0.131	0.165		
8	1	0.842	0.577	0.319	0.841	0.883	0.158	0.168
	2	0.484	0.320	0.247	0.533	0.803		
	3	0.173	0.272	0.180	0.260	0.304		
9	1	0.660	0.509	0.413	0.655	0.734	1.58	0.752
	2	0.473	0.439	0.366	0.472	0.591		
	3	0.239	0.289	0.260	0.289	0.340		
10	1	0.266	0.325	0.222	0.381	0.502	0.221	0.209
	2	0.233	0.279	0.224	0.285	0.251		
	3	0.233	0.249	0.228	0.281	0.232		
11	1	0.274	0.384	0.218	0.389	0.501	0.201	0.248
	2	0.223	0.300	0.221	0.322	0.270		
	3	0.111	0.118	0.194	0.225	0.144		
12	1	0.316	0.409	0.197	0.402	0.620	0.185	0.173
	2	0.296	0.373	0.172	0.383	0.289		
	3	0.153	0.182	0.088	0.225	0.120		
13	1	0.766	0.447	0.313	0.835	0.968	0.261	0.307
	2	0.329	0.346	0.321	0.359	0.502		
	3	0.284	0.285	0.336	0.270	0.368		
14	1	0.782	0.644	0.525	0.810	0.894	1.41	1.67
	2	0.604	0.619	0.530	0.623	0.696		
	3	0.538	0.591	0.486	0.573	0.585		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
15	1	0.589	0.427	0.250	0.647	0.745	0.192	0.247
	2	0.320	0.358	0.232	0.373	0.444		
	3	0.157	0.206	0.194	0.207	0.206		
16	1	0.852	0.718	0.525	0.894	0.995	0.528	0.720
	2	0.566	0.631	0.484	0.619	0.659		
	3	0.486	0.559	0.429	0.551	0.500		
17	1	1.02	0.703	0.381	1.02	1.08	1.31	1.52
	2	0.812	0.653	0.292	0.811	1.03		
	3	0.518	0.632	0.260	0.607	0.679		
18	1	0.428	0.254	0.308	0.374	0.531	0.140	0.215
	2	0.320	0.254	0.326	0.261	0.437		
	3	0.164	0.180	0.116	0.168	0.290		
19	1	0.643	0.581	0.562	0.627	0.767	1.14	1.29
	2	0.570	0.579	0.560	0.576	0.636		
	3	0.352	0.384	0.241	0.387	0.463		
20	1	0.690	0.527	0.317	0.756	0.891	0.236	0.318
	2	0.209	0.305	0.287	0.292	0.326		
	3	0.210	0.274	0.251	0.293	0.204		
21	1	0.550	0.407	0.204	0.618	0.711	0.188	0.220
	2	0.223	0.296	0.190	0.298	0.376		
	3	0.128	0.217	0.192	0.215	0.209		
22	1	0.402	0.389	0.221	0.453	0.622	0.139	0.219
	2	0.253	0.341	0.183	0.337	0.264		
	3	0.202	0.146	0.189	0.286	0.128		
23	1	0.396	0.250	0.219	0.421	0.656	0.141	0.161
	2	0.143	0.183	0.194	0.178	0.245		
	3	0.128	0.133	0.194	0.160	0.167		
24	1	0.674	0.556	0.517	0.753	0.810	0.424	0.503
	2	0.305	0.303	0.444	0.291	0.442		
	3	0.319	0.274	0.367	0.304	0.329		
25	1	0.403	0.280	0.265	0.386	0.443	0.685	0.724
	2	0.299	0.282	0.260	0.295	0.388		
	3	0.257	0.262	0.275	0.269	0.235		
26	1	0.713	0.633	0.551	0.686	0.804	0.457	0.461
	2	0.492	0.509	0.506	0.484	0.684		
	3	0.505	0.540	0.532	0.509	0.582		
				Nickel Alloys				
1	1	0.273	0.200	0.197	0.294	0.342	0.116	0.208
	2	0.179	0.171	0.181	0.172	0.203		
	3	0.161	0.150	0.169	0.149	0.168		
2	1	0.307	0.231	0.178	0.339	0.395	0.191	0.176
	2	0.176	0.187	0.159	0.192	0.226		
	3	0.119	0.130	0.117	0.138	0.121		
3	1	0.441	0.254	0.262	0.478	0.520	0.074	0.142
	2	0.095	0.113	0.084	0.117	0.149		
	3	0.069	0.065	0.076	0.078	0.079		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
4	1	0.146	0.108	0.085	0.163	0.210	0.065	0.096
	2	0.065	0.042	0.072	0.041	0.090		
	3	0.063	0.042	0.063	0.041	0.091		
5	1	0.212	0.177	0.205	0.197	0.252	0.186	0.149
	2	0.218	0.159	0.174	0.199	0.247		
	3	0.209	0.182	0.182	0.193	0.222		
6	1	0.293	0.265	0.255	0.313	0.332	0.190	0.253
	2	0.224	0.221	0.227	0.222	0.219		
	3	0.231	0.224	0.233	0.229	0.225		
7	1	0.442	0.368	0.353	0.455	0.518	0.370	0.411
	2	0.297	0.302	0.301	0.298	0.316		
	3	0.248	0.238	0.258	0.233	0.261		
8	1	0.383	0.240	0.199	0.430	0.467	0.120	0.187
	2	0.178	0.184	0.172	0.188	0.197		
	3	0.113	0.120	0.114	0.120	0.113		
9	1	0.299	0.248	0.242	0.297	0.393	0.178	0.260
	2	0.205	0.191	0.220	0.197	0.211		
	3	0.211	0.163	0.214	0.204	0.194		
10	1	0.504	0.393	0.350	0.465	0.581	0.599	0.811
	2	0.324	0.345	0.306	0.340	0.382		
	3	0.268	0.302	0.259	0.308	0.271		
11	1	0.717	0.342	0.227	0.714	0.834	note 1	note 1
	2	0.258	0.219	0.154	0.250	0.424		
	3	0.182	0.157	0.149	0.154	0.295		
12	1	0.104	0.137	0.102	0.145	0.160	0.152	0.111
	2	0.102	0.086	0.089	0.117	0.084		
	3	0.100	0.086	0.087	0.115	0.083		
13	1	0.158	0.145	0.134	0.174	0.177	0.066	0.130
	2	0.083	0.072	0.074	0.079	0.074		
	3	0.085	0.070	0.075	0.081	0.076		
14	1	0.269	0.206	0.174	0.292	0.337	0.122	0.172
	2	0.133	0.148	0.132	0.144	0.151		
	3	0.105	0.106	0.108	0.100	0.107		
15	1	0.372	0.145	0.111	0.399	0.447	0.059	0.099
	2	0.129	0.097	0.093	0.126	0.188		
	3	0.104	0.080	0.094	0.081	0.130		
16	1	0.384	0.370	0.333	0.418	0.441	0.232	0.354
	2	0.263	0.275	0.260	0.274	0.263		
	3	0.242	0.226	0.227	0.246	0.223		
17	1	0.274	0.245	0.227	0.290	0.317	0.220	0.231
	2	0.203	0.209	0.197	0.213	0.195		
	3	0.206	0.191	0.187	0.216	0.197		
18	1	0.309	0.201	0.167	0.334	0.411	0.172	0.223
	2	0.145	0.148	0.140	0.146	0.185		
	3	0.124	0.123	0.127	0.120	0.150		
19	1	0.295	0.186	0.170	0.290	0.439	0.290	0.179
	2	0.166	0.162	0.171	0.162	0.177		
	3	0.168	0.158	0.173	0.162	0.179		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
20	1	0.364	0.304	0.301	0.364	0.403	note 1	note 1
	2	0.313	0.304	0.300	0.309	0.337		
	3	0.293	0.298	0.294	0.294	0.304		
21	1	0.212	0.149	0.130	0.219	0.459	0.134	0.135
	2	0.124	0.130	0.125	0.131	0.132		
	3	0.125	0.126	0.126	0.132	0.126		
22	1	0.271	0.215	0.219	0.279	0.326	0.186	0.216
	2	0.225	0.215	0.226	0.212	0.239		
	3	0.228	0.218	0.231	0.212	0.238		
23	1	0.395	0.201	0.174	0.417	0.497	0.155	0.158
	2	0.165	0.154	0.139	0.172	0.253		
	3	0.128	0.112	0.137	0.125	0.131		
24	1	0.313	0.131	0.141	0.308	0.440	0.111	0.111
	2	0.163	0.126	0.135	0.142	0.199		
	3	0.161	0.117	0.128	0.129	0.186		
				Cobalt Alloys				
1	1	0.251	0.282	0.252	0.272	0.283	0.138	0.209
	2	0.244	0.187	0.182	0.263	0.191		
	3	0.220	0.182	0.184	0.232	0.192		
2	1	0.281	0.234	0.238	0.273	0.265	0.250	0.297
	2	0.286	0.222	0.232	0.279	0.271		
	3	0.262	0.210	0.224	0.256	0.250		
3	1	0.279	0.175	0.166	0.274	0.337	0.149	0.116
	2	0.181	0.176	0.168	0.184	0.220		
	3	0.131	0.126	0.134	0.140	0.134		
4	1	0.200	0.225	0.178	0.242	0.348	0.168	0.213
	2	0.174	0.191	0.164	0.203	0.169		
	3	0.173	0.151	0.129	0.209	0.139		
5	1	0.297	0.313	0.291	0.312	0.338	0.443	0.359
	2	0.289	0.297	0.291	0.303	0.287		
	3	0.292	0.301	0.291	0.308	0.289		
6	1	0.314	0.334	0.317	0.323	0.355	0.313	0.350
	2	0.317	0.301	0.308	0.323	0.303		
	3	0.318	0.283	0.298	0.321	0.308		
7	1	0.294	0.276	0.299	0.290	0.343	0.262	0.345
	2	0.293	0.275	0.299	0.273	0.296		
	3	0.289	0.273	0.297	0.269	0.297		
8	1	0.200	0.152	0.151	0.201	0.217	0.166	0.174
	2	0.162	0.153	0.155	0.157	0.172		
	3	0.159	0.157	0.159	0.155	0.161		
9	1	0.269	0.275	0.276	0.271	0.282	0.273	0.304
	2	0.273	0.278	0.282	0.270	0.273		
	3	0.245	0.248	0.253	0.242	0.244		
10	1	0.408	0.185	0.211	0.411	0.465	0.271	0.226
	2	0.231	0.175	0.179	0.200	0.260		
	3	0.233	0.170	0.171	0.203	0.257		

Table 4. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
11	1	0.251	0.241	0.217	0.261	0.326	note 2	note 2
	2	0.204	0.196	0.198	0.218	0.197		
	3	0.199	0.197	0.199	0.206	0.197		
12	1	0.144	0.152	0.127	0.184	0.217	0.091	0.094
	2	0.121	0.117	0.125	0.127	0.118		
	3	0.117	0.122	0.122	0.125	0.122		
13	1	0.236	0.172	0.136	0.266	0.312	0.130	0.131
	2	0.114	0.109	0.118	0.122	0.114		
	3	0.111	0.109	0.116	0.122	0.117		
14	1	0.386	0.249	0.239	0.439	0.559	0.295	0.438
	2	0.238	0.207	0.240	0.209	0.281		
	3	0.239	0.208	0.237	0.205	0.267		
15	1	0.165	0.136	0.135	0.155	0.206	0.154	0.151
	2	0.143	0.136	0.136	0.136	0.167		
	3	0.135	0.136	0.135	0.135	0.141		
16	1	0.326	0.257	0.254	0.325	0.350	0.405	0.425
	2	0.274	0.258	0.253	0.274	0.312		
	3	0.233	0.235	0.227	0.237	0.253		
17	1	0.295	0.289	0.281	0.309	0.306	0.186	0.223
	2	0.235	0.244	0.234	0.240	0.231		
	3	0.237	0.229	0.222	0.239	0.230		
18	1	0.172	0.153	0.146	0.192	0.208	0.122	0.133
	2	0.122	0.117	0.127	0.117	0.118		
	3	0.126	0.123	0.130	0.121	0.121		

Note 1. Insufficient number of stress levels at each temperature to allow calculation.

Note 2. One data point outside stress range of master curve.

Table 5. Average Values of Standard Deviation of Regression (Equation 20) for Each Complete Data Set: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	0.210	0.198	0.196	0.217	0.216	0.193	0.206
Rank	5	3	2	7	6	1	4
				Ferritic Steels			
Value	0.241	0.230	0.224	0.251	0.272	0.236	0.294
Rank	4	2	1	5	6	3	7
				Aluminum Alloys			
Value	0.359	0.365	0.305	0.389	0.459	0.486	0.529
Rank	2	3	1	4	5	6	7
				Nickel Alloys			
Value	0.185	0.177	0.172	0.185	0.214	0.181	0.219
Rank	4	2	1	4	6	3	7
				Cobalt Alloys			
Value	0.217	0.202	0.205	0.217	0.221	0.245	0.246
Rank	3	1	2	3	5	6	7
				All Data			
Value	0.244	0.236	0.222	0.254	0.279	0.269	0.303
Rank	3	2	1	4	6	5	7

Table 6. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Standard Deviation of Regression; Second Order Polynomial

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	0	2	2	4	3	10	8
2nd	2	8	8	1	3	2	8
3rd	7	4	9	3	2	1	2
4th	10	6	3	2	4	4	1
5th	4	4	6	5	4	2	1
6th	6	4	1	5	4	3	6
7th	0	1	0	9	9	7	3
Average	4.17	3.62	3.21	4.86	4.76	3.79	3.31
Rank	5	3	1	7	6	4	2
			Ferritic Steels				
1st	5	4	5	1	2	15	5
2nd	4	5	11	4	5	1	2
3rd	6	5	5	1	6	1	3
4th	6	8	5	6	2	5	3
5th	4	6	4	10	4	2	2
6th	6	4	1	7	4	5	4
7th	1	0	1	3	9	3	13
Average	3.69	3.59	2.97	4.66	4.53	3.16	4.84
Rank	4	3	1	6	5	2	7
			Aluminum Alloys				
1st	2	0	10	2	1	10	1
2nd	4	7	4	1	0	5	5
3rd	5	5	5	5	0	2	5
4th	12	1	0	6	3	2	1
5th	3	7	1	4	11	0	1
6th	0	5	3	5	2	6	4
7th	0	1	3	3	9	1	9
Average	3.38	4.04	2.96	4.38	5.50	2.96	4.69
Rank	3	4	1	5	7	1	6

Table 6. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	2	1	6	2	2	11	2
2nd	2	9	7	2	1	0	1
3rd	8	5	3	6	2	1	0
4th	5	7	3	3	0	2	3
5th	3	1	3	7	7	1	2
6th	4	1	2	4	4	5	2
7th	0	0	0	0	8	2	12
Average	3.71	3.04	2.83	3.96	5.21	3.23	5.55
Rank	4	2	1	5	6	3	7
			Cobalt Alloys				
1st	0	9	3	3	1	4	1
2nd	3	1	4	2	3	2	2
3rd	2	3	4	3	3	2	0
4th	6	2	3	0	4	1	1
5th	5	2	0	4	3	2	2
6th	2	0	4	4	2	4	1
7th	0	1	0	2	2	2	10
Average	4.06	2.50	3.28	4.11	4.06	3.88	5.59
Rank	4	1	2	6	4	3	7
			All Data				
1st	9	16	26	12	9	50	17
2nd	15	30	34	10	12	10	18
3rd	28	22	26	18	13	7	10
4th	39	24	14	17	13	14	9
5th	19	20	14	30	29	7	8
6th	18	14	11	25	16	23	17
7th	1	3	4	17	37	15	47
Average	3.79	3.44	3.04	4.44	4.84	3.38	4.68
Rank	4	3	1	5	7	2	6

Table 7. Average Values of Standard Deviation of Regression (Equation 20) for Each Complete Data Set: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	0.197	0.176	0.181	0.203	0.194	0.193	0.206
Rank	5	1	2	6	4	3	7
				Ferritic Steels			
Value	0.221	0.200	0.203	0.230	0.217	0.237	0.294
Rank	4	1	2	5	3	6	7
				Aluminum Alloys			
Value	0.262	0.286	0.256	0.305	0.305	0.486	0.529
Rank	2	3	1	4	4	6	7
				Nickel Alloys			
Value	0.164	0.154	0.159	0.157	0.186	0.181	0.219
Rank	4	1	3	2	6	5	7
				Cobalt Alloys			
Value	0.207	0.192	0.196	0.207	0.207	0.245	0.246
Rank	3	1	2	3	3	6	7
				All Data			
Value	0.211	0.202	0.200	0.222	0.222	0.270	0.303
Rank	3	2	1	4	4	6	7

Table 8. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Standard Deviation of Regression; Third Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	3	0	4	5	5	7	7
2nd	4	12	6	4	1	0	1
3rd	7	7	5	2	5	2	5
4th	3	3	7	2	5	4	1
5th	4	6	5	5	7	1	1
6th	8	1	2	3	3	6	5
7th	0	0	0	8	3	9	9
Average	3.86	3.21	3.31	4.34	4.00	4.59	4.34
Rank	3	1	2	5	4	7	5
			Ferritic Steels				
1st	4	4	8	3	2	9	3
2nd	2	11	6	3	9	2	2
3rd	5	6	6	3	6	1	3
4th	10	3	5	5	6	3	1
5th	4	4	4	10	4	3	3
6th	5	4	2	5	4	8	3
7th	2	0	1	3	1	6	17
Average	3.97	3.13	3.03	4.34	3.53	4.16	5.38
Rank	4	2	1	6	3	5	7
			Aluminum Alloys				
1st	6	4	9	0	3	3	1
2nd	7	5	1	4	4	4	2
3rd	8	3	2	4	3	5	0
4th	3	5	6	6	5	1	1
5th	2	4	3	5	6	2	3
6th	0	5	2	4	2	10	3
7th	0	0	3	3	3	1	16
Average	2.54	3.58	3.42	4.39	3.96	4.12	5.92
Rank	1	3	2	6	4	5	7

Table 8. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	3	4	4	4	3	6	2
2nd	4	10	3	6	2	1	0
3rd	4	5	5	1	4	1	1
4th	4	4	5	2	4	3	1
5th	5	1	3	10	5	1	0
6th	4	0	4	1	2	8	2
7th	0	0	0	0	4	2	16
Average	3.67	2.08	3.50	3.46	4.17	4.09	6.05
Rank	4	1	3	2	6	5	7
			Cobalt Alloys				
1st	1	5	3	5	3	4	1
2nd	2	4	5	1	2	0	1
3rd	6	3	5	1	1	2	1
4th	2	6	2	1	5	2	1
5th	4	0	2	4	6	0	1
6th	3	0	1	3	1	5	2
7th	0	0	0	3	0	4	10
Average	3.83	2.56	2.89	4.06	3.67	4.47	5.71
Rank	4	1	2	5	3	6	7
			All Data				
1st	17	17	28	17	16	29	14
2nd	19	42	21	18	18	7	6
3rd	30	24	23	11	19	11	10
4th	22	21	25	16	25	13	5
5th	19	15	17	34	28	7	8
6th	20	10	11	16	12	37	15
7th	2	0	4	17	11	22	68
Average	3.58	3.04	3.24	4.15	3.86	4.28	5.41
Rank	3	1	2	5	4	6	7

Table 9. Average Deviation of Stress (Equation 25) for Each Complete Data Set.

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1	4.11	4.64	2.86	5.66	6.52	3.24	1.98
	2	2.29	2.82	1.90	2.95	2.03		
	3	4.01	1.74	1.65	4.21	1.78		
2	1	5.37	4.63	5.51	4.85	6.25	3.43	3.84
	2	5.36	4.13	5.14	4.75	5.71		
	3	4.18	3.22	3.74	3.40	5.05		
3	1	4.72	2.44	3.42	4.83	7.01	2.36	1.67
	2	3.71	1.95	2.62	3.15	4.59		
	3	3.71	1.97	2.61	3.18	6.05		
4	1	13.50	13.89	13.83	13.66	14.15	12.19	12.37
	2	14.08	11.94	14.65	13.73	13.60		
	3	note 2	note 2	note 2	note 2	note 2		
5	1	7.00	7.98	6.47	8.14	7.08	5.92	4.80
	2	7.10	5.46	4.50	7.75	5.94		
	3	7.18	4.80	4.54	7.78	6.14		
6	1	5.93	5.89	4.03	6.92	9.26	4.61	4.46
	2	4.27	4.16	4.12	4.77	4.74		
	3	3.64	3.74	3.34	4.33	3.47		
7	1	14.09	5.26	6.77	16.90	18.79	7.48	3.42
	2	4.50	3.68	2.92	6.36	9.82		
	3	2.65	2.60	2.16	2.69	3.63		
8	1	8.16	4.47	2.94	9.95	11.80	4.48	2.47
	2	3.52	2.98	2.63	3.53	6.96		
	3	2.91	2.65	3.03	2.61	3.48		
9	1	3.31	4.12	3.13	3.92	5.36	4.58	3.73
	2	3.12	3.69	3.42	3.68	3.56		
	3	3.11	3.02	2.61	3.80	2.61		
10	1	6.65	5.82	5.46	7.68	9.36	6.55	6.30
	2	5.66	5.35	5.44	5.61	6.60		
	3	4.64	4.46	4.72	4.42	4.89		
11	1	8.54	12.63	7.29	12.46	10.26	9.96	8.38
	2	7.97	8.27	6.60	10.67	6.62		
	3	7.48	6.06	6.05	9.89	5.90		
12	1	12.01	10.67	8.73	11.66	9.40	10.48	7.32
	2	11.21	9.26	7.68	11.61	9.36		
	3	10.91	6.27	5.60	11.41	9.12		
13	1	6.96	7.04	5.53	8.06	10.46	3.08	4.27
	2	4.58	4.72	4.72	5.56	4.40		
	3	4.26	3.45	3.90	5.12	3.50		
14	1	3.94	3.52	2.94	4.63	4.89	2.41	2.81
	2	2.53	2.78	2.46	2.75	2.64		
	3	2.53	2.56	2.40	2.66	2.45		

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
15	1	13.80	7.94	6.99	16.69	24.19	5.76	7.29
	2	6.37	5.89	5.89	6.08	8.99		
	3	5.78	5.55	5.94	5.63	6.46		
16	1	9.67	7.77	7.01	11.12	15.83	6.55	6.83
	2	5.85	5.52	6.24	5.60	7.08		
	3	6.05	5.28	6.44	5.53	6.26		
17	1	9.24	9.96	8.47	11.22	12.14	11.13	7.20
	2	7.67	7.49	7.07	8.44	7.07		
	3	7.42	6.60	6.69	8.17	6.61		
18	1	11.48	10.27	10.72	11.63	11.92	8.20	8.73
	2	5.88	5.36	5.98	5.40	5.80		
	3	5.94	5.67	6.46	5.61	5.93		
19	1	9.79	5.43	4.98	10.67	13.25	3.90	4.64
	2	5.17	4.25	4.14	5.14	6.29		
	3	2.97	2.83	3.11	2.88	3.26		
20	1	2.95	3.86	2.92	4.16	6.17	3.84	2.71
	2	3.07	2.90	2.96	3.31	2.99		
	3	3.06	3.04	3.14	3.34	3.72		
21	1	13.12	5.61	5.11	14.05	20.78	6.94	8.47
	2	7.41	5.98	5.53	6.91	7.83		
	3	3.73	3.42	3.88	3.49	4.12		
22	1	5.03	6.03	4.70	5.93	8.46	3.23	4.32
	2	4.54	4.59	4.59	5.32	4.46		
	3	5.63	4.16	4.57	6.53	4.33		
23	1	6.58	5.87	3.82	8.16	11.74	0.92	1.54
	2	3.11	4.11	2.86	4.16	3.87		
	3	3.02	2.89	2.41	4.13	2.48		
24	1	15.03	15.49	15.04	14.99	14.51	9.41	11.55
	2	15.23	11.98	13.28	14.61	13.47		
	3	15.41	9.26	10.39	14.62	13.97		
25	1	6.71	7.67	6.33	8.20	8.81	6.18	4.44
	2	5.94	6.04	5.30	6.43	5.54		
	3	5.80	4.32	4.27	6.30	5.04		
26	1	7.37	6.32	5.38	9.27	9.37	8.15	5.39
	2	5.96	5.67	5.29	6.08	6.47		
	3	5.29	5.14	5.06	5.37	5.65		
27	1	9.13	5.88	5.52	10.67	12.01	3.83	3.93
	2	5.11	5.57	4.65	5.04	6.30		
	3	2.47	2.72	2.42	2.63	2.70		
28	1	6.35	5.33	4.48	7.58	8.01	5.47	4.59
	2	4.36	4.38	4.48	4.43	4.63		
	3	4.22	3.96	4.36	3.94	4.21		
29	1	2.99	2.44	2.64	2.66	2.67	4.50	2.44
	2	2.15	2.25	2.23	2.23	2.29		
	3	2.33	2.28	2.34	2.30	2.36		

Ferritic Steels

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
1	1	2.52	2.70	2.19	2.97	3.39	1.36	1.68
	2	1.99	2.04	1.91	2.20	1.90		
	3	1.94	1.78	1.89	2.10	1.84		
2	1	8.62	3.86	5.39	9.71	11.75	1.72	2.25
	2	2.78	2.60	1.80	2.60	3.14		
	3	1.57	1.67	1.45	1.83	1.47		
3	1	3.61	3.03	3.14	3.72	4.65	3.48	3.88
	2	2.49	2.23	2.57	2.39	2.38		
	3	2.28	2.20	2.33	2.18	3.20		
4	1	2.46	2.81	2.24	2.86	2.73	1.34	1.89
	2	2.03	1.84	1.47	2.41	1.76		
	3	1.78	1.45	1.19	2.16	1.47		
5	1	4.53	3.99	4.18	4.36	6.47	5.44	4.70
	2	4.03	3.69	4.18	3.66	4.73		
	3	3.92	3.48	3.90	3.48	4.50		
6	1	11.94	7.61	7.97	13.22	15.17	4.44	5.49
	2	5.28	4.75	3.97	5.15	5.91		
	3	2.85	2.78	2.92	2.86	3.13		
7	1	12.45	11.27	11.17	13.19	13.94	14.26	17.79
	2	9.98	8.61	8.61	9.47	8.63		
	3	8.95	7.92	7.91	8.92	8.37		
8	1	9.00	7.38	7.58	9.76	9.91	4.60	7.22
	2	5.65	5.39	3.98	6.74	6.46		
	3	3.24	3.53	3.22	3.46	3.25		
9	1	4.89	4.13	4.14	5.55	5.55	4.59	4.10
	2	4.05	4.36	4.37	4.22	4.22		
	3	4.88	4.09	4.07	4.04	4.04		
10	1	14.37	11.87	9.98	15.38	20.55	24.90	19.30
	2	9.26	9.59	9.18	10.88	9.53		
	3	5.65	6.94	6.79	6.62	5.30		
11	1	18.13	10.37	13.06	21.23	22.71	18.19	21.58
	2	5.64	4.06	3.77	6.37	7.09		
	3	3.62	3.80	3.59	3.81	3.74		
12	1	7.48	5.96	4.82	8.08	9.62	1.58	3.63
	2	2.28	2.46	2.18	3.08	1.80		
	3	2.01	1.34	1.75	2.37	1.58		
13	1	8.20	8.30	6.73	9.07	9.75	2.74	6.01
	2	2.96	2.23	1.94	3.47	1.68		
	3	note 2	1.39	note 2	note 2	note 2		
14	1	10.81	5.96	6.05	11.87	15.13	4.09	3.48
	2	4.13	3.53	2.74	4.26	5.94		
	3	2.30	2.22	2.14	2.82	2.18		
15	1	11.41	5.41	6.01	13.42	15.91	3.40	3.90
	2	3.43	3.57	2.94	3.19	4.89		
	3	3.35	3.02	3.23	3.16	3.02		

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
16	1	13.88	10.77	10.74	15.54	16.17	5.23	9.24
	2	6.17	6.00	6.41	5.55	5.66		
	3	6.20	4.29	4.74	5.90	5.60		
17	1	14.28	12.84	10.17	17.01	18.10	12.07	13.12
	2	9.49	9.17	9.59	9.30	8.10		
	3	5.29	4.29	3.66	6.23	3.88		
18	1	16.50	8.26	9.72	17.63	21.74	12.21	12.78
	2	7.90	5.98	5.23	8.35	9.80		
	3	3.70	4.59	4.08	4.24	3.84		
19	1	9.82	7.54	8.84	10.39	10.42	3.54	4.87
	2	3.56	3.69	3.56	3.68	3.55		
	3	2.64	2.43	2.21	2.65	2.56		
20	1	7.84	4.46	6.38	8.92	12.82	8.43	4.77
	2	7.22	4.21	4.62	5.67	9.36		
	3	7.64	3.00	3.65	6.29	9.25		
21	1	10.99	8.97	6.04	11.63	18.38	3.21	4.70
	2	4.96	6.45	4.90	7.20	8.39		
	3	3.19	3.58	2.83	5.26	3.26		
22	1	14.79	8.40	11.60	16.40	16.93	3.39	4.11
	2	4.42	4.18	4.35	4.43	5.06		
	3	2.84	2.15	2.43	2.70	2.17		
23	1	7.94	5.78	5.73	8.68	9.50	2.43	2.10
	2	5.18	5.36	5.32	5.19	5.62		
	3	5.14	5.31	5.31	5.11	5.24		
24	1	3.24	3.29	2.13	4.69	5.29	3.33	1.61
	2	1.95	2.33	1.62	2.46	1.76		
	3	1.61	1.67	1.50	1.98	1.52		
25	1	2.34	2.00	2.28	1.94	2.19	1.93	1.86
	2	2.15	1.83	2.25	1.92	2.05		
	3	2.16	1.83	2.29	1.92	2.06		
26	1	4.90	4.41	3.80	5.07	4.22	3.68	3.21
	2	4.85	3.39	3.13	5.07	4.21		
	3	3.58	2.96	2.80	3.68	3.20		
27	1	10.89	6.52	9.06	11.90	11.90	3.03	4.88
	2	8.04	2.37	4.35	9.63	9.62		
	3	6.05	2.39	4.32	7.02	7.02		
28	1	14.17	13.08	12.63	13.60	13.59	10.93	11.97
	2	14.51	9.94	14.89	13.60	13.60		
	3	23.02	note 2	note 2	note 2	note 2		
29	1	9.44	5.24	7.71	10.36	10.36	7.87	4.04
	2	7.58	5.00	6.16	8.52	4.52		
	3	5.15	3.81	4.50	5.50	5.50		
30	1	11.60	10.36	10.70	12.19	12.19	10.80	10.26
	2	10.65	10.34	10.40	10.83	10.83		
	3	10.07	9.29	9.74	10.24	10.24		
31	1	12.54	11.90	12.11	12.86	12.86	7.30	11.32
	2	8.61	9.57	9.46	9.19	9.19		

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	3	8.83	6.80	6.86	8.40	8.40		
32	1	8.52	7.02	7.62	9.09	9.09	5.09	6.14
	2	4.28	4.34	4.27	4.53	4.53		
	3	4.15	3.99	3.99	4.08	4.08		
				Aluminum Alloys				
1	1	15.85	5.59	3.72	18.84	24.02	note 2	note 2
	2	5.37	4.49	3.11	5.74	7.82		
	3	2.99	3.48	2.16	3.53	4.50		
2	1	11.51	8.07	6.35	14.29	16.45	6.02	6.93
	2	3.70	3.70	3.98	3.92	4.05		
	3	note 2	2.04	3.55	note 2	8.42		
3	1	8.66	3.79	4.96	10.25	10.32	3.78	4.09
	2	5.03	3.45	4.44	5.22	5.11		
	3	2.69	3.54	2.74	2.94	2.87		
4	1	10.67	4.06	2.95	12.04	15.59	17.45	15.72
	2	2.86	2.85	1.45	3.08	4.89		
	3	1.80	2.03	1.28	2.04	2.59		
5	1	7.77	5.78	3.22	10.50	12.03	2.60	3.02
	2	2.50	4.55	2.84	3.98	2.49		
	3	2.02	1.04	3.04	2.69	1.69		
6	1	7.67	4.82	3.65	10.50	11.59	2.49	3.00
	2	1.78	2.90	3.25	2.44	3.23		
	3	2.66	1.62	2.10	1.81	1.95		
7	1	5.35	3.95	4.16	8.12	8.70	2.72	3.34
	2	2.48	2.30	4.05	2.47	4.11		
	3	2.35	1.91	3.88	1.89	2.78		
8	1	20.19	4.13	2.50	22.68	35.05	0.65	1.09
	2	4.41	2.14	1.10	4.43	8.81		
	3	0.84	1.20	note 2	1.12	2.31		
9	1	16.46	8.43	7.04	17.67	23.98	note 2	note 2
	2	8.46	7.74	7.10	8.66	10.17		
	3	3.89	4.70	3.26	4.97	5.25		
10	1	4.45	5.27	3.54	6.83	9.20	3.92	3.12
	2	3.43	4.44	3.37	4.38	4.14		
	3	3.37	3.69	3.39	4.28	3.48		
11	1	6.24	9.16	5.69	9.44	13.00	6.23	6.47
	2	5.18	7.98	5.46	7.73	6.72		
	3	2.39	2.85	4.55	4.78	3.22		
12	1	6.49	8.65	4.42	9.02	18.40	4.69	3.04
	2	6.21	8.57	4.33	8.21	6.30		
	3	2.50	2.65	1.39	3.57	2.10		
13	1	8.91	4.12	2.91	11.07	14.45	2.40	3.04
	2	2.59	3.62	2.90	4.16	4.62		
	3	2.22	2.37	2.94	2.40	2.86		
14	1	13.06	7.52	5.19	15.67	22.13	44.60	30.27

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	2	6.30	5.89	4.51	6.65	9.43		
	3	4.64	5.24	4.47	5.15	6.09		
15	1	10.69	8.17	5.14	13.59	18.63	4.78	5.48
	2	6.40	7.24	4.23	8.11	8.82		
	3	3.06	3.98	3.38	4.07	4.03		
16	1	16.87	12.01	9.18	20.87	29.50	16.94	47.82
	2	10.24	10.10	8.39	10.80	8.56		
	3	8.39	9.18	7.73	9.32	8.15		
17	1	16.62	3.29	1.55	18.63	29.56	9.46	8.54
	2	5.40	2.02	0.90	5.00	10.46		
	3	1.82	1.85	0.70	1.96	3.73		
18	1	12.37	4.76	8.30	10.75	22.29	3.51	4.83
	2	6.83	4.53	8.08	5.06	9.36		
	3	2.69	3.14	1.66	3.15	6.49		
19	1	22.35	16.87	17.54	21.44	54.62	13.78	12.08
	2	16.60	16.50	17.04	16.91	23.35		
	3	6.04	5.46	3.50	6.16	9.71		
20	1	5.03	3.54	2.66	6.12	8.01	2.13	2.64
	2	1.62	1.53	2.03	1.67	2.65		
	3	1.70	1.88	1.88	1.99	1.96		
21	1	6.16	3.68	1.91	7.90	9.98	2.09	2.29
	2	2.34	2.78	1.55	2.83	5.02		
	3	0.94	1.34	1.41	1.59	1.59		
22	1	6.12	5.42	3.66	7.48	12.05	2.63	3.16
	2	3.96	4.86	3.18	5.05	4.97		
	3	2.51	1.73	2.91	3.42	1.65		
23	1	6.84	3.89	3.36	7.91	14.76	2.08	2.37
	2	2.37	3.04	2.56	2.81	5.60		
	3	1.78	1.83	2.92	2.14	2.56		
24	1	5.98	3.25	4.13	7.94	11.17	2.50	2.63
	2	2.14	2.40	2.81	2.02	3.35		
	3	note 2	1.14	7.30	8.58	1.91		
25	1	10.89	2.78	2.68	10.29	18.40	3.83	3.88
	2	5.60	2.31	1.91	4.69	8.09		
	3	1.80	2.20	1.95	1.92	1.88		
26	1	5.81	3.72	2.76	6.08	8.45	1.94	2.20
	2	1.56	1.53	1.86	1.65	3.29		
	3	1.69	1.83	1.91	1.88	2.38		
				Nickel Alloys				
1	1	9.02	6.48	6.23	9.88	12.90	4.56	6.03
	2	5.45	5.23	5.40	5.36	6.13		
	3	5.08	4.74	5.26	4.75	5.33		
2	1	9.23	6.38	4.59	10.96	14.41	6.49	4.99
	2	5.11	4.93	3.92	5.60	6.84		
	3	2.48	2.93	2.52	3.19	2.76		

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
3	1	6.95	4.01	3.70	8.25	9.29	1.02	2.21
	2	1.57	1.59	1.15	2.19	2.73		
	3	0.78	0.78	0.86	1.09	1.01		
4	1	4.32	2.75	2.28	4.94	6.40	2.20	2.38
	2	1.74	1.16	1.91	1.17	2.65		
	3	1.88	1.58	1.70	1.83	2.52		
5	1	5.01	3.85	4.64	4.54	6.22	3.20	3.03
	2	4.97	3.27	3.50	4.33	5.86		
	3	4.47	3.54	3.53	4.05	4.91		
6	1	9.73	9.11	8.69	10.73	11.88	7.08	7.50
	2	7.36	7.74	7.49	7.46	7.47		
	3	15.39	7.19	7.28	7.52	7.28		
7	1	17.38	13.37	13.63	18.31	22.43	13.11	13.28
	2	13.77	12.96	14.53	13.61	16.15		
	3	10.65	9.03	11.22	9.05	11.22		
8	1	12.44	6.53	5.27	14.91	17.23	3.78	4.90
	2	6.34	5.32	5.05	6.12	6.94		
	3	2.93	3.09	3.02	2.98	3.11		
9	1	8.14	6.21	5.66	7.54	12.27	3.80	5.31
	2	4.92	4.49	5.48	4.42	5.20		
	3	4.68	3.40	4.85	4.43	4.46		
10	1	26.71	18.72	13.47	26.93	44.60	note 2	note 2
	2	14.18	10.71	9.20	12.77	12.92		
	3	6.91	7.56	6.40	8.50	6.72		
11	1	35.03	8.66	6.31	33.75	67.24	note 1	note 1
	2	13.63	6.10	5.20	9.69	15.22		
	3	5.91	4.59	4.66	4.20	11.28		
12	1	3.32	4.74	3.29	4.58	4.81	5.84	3.29
	2	3.29	2.76	2.99	4.03	2.82		
	3	3.76	2.87	3.18	4.34	3.17		
13	1	6.50	5.92	5.52	7.27	7.36	2.17	5.43
	2	3.18	2.61	2.59	2.88	2.72		
	3	3.79	2.89	2.60	3.05	2.86		
14	1	10.22	6.84	5.53	11.55	14.23	3.97	6.10
	2	4.97	5.16	4.33	4.77	5.77		
	3	3.15	3.18	3.30	2.95	3.63		
15	1	15.10	4.58	3.64	17.47	22.34	2.25	3.27
	2	3.90	3.03	2.58	3.89	8.10		
	3	2.94	2.29	2.63	2.33	3.92		
16	1	15.14	14.16	12.34	17.78	19.08	8.60	12.52
	2	10.06	9.87	8.92	9.75	9.89		
	3	7.41	5.44	5.80	7.51	5.98		
17	1	11.79	11.45	10.29	13.15	16.41	8.32	8.57
	2	9.10	9.72	10.33	9.61	9.27		
	3	9.32	9.35	9.53	9.96	8.96		
18	1	9.69	5.52	4.04	11.26	14.91	4.14	4.55
	2	3.18	3.57	3.01	3.36	4.71		

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	3	3.09	2.89	3.01	2.81	4.41		
19	1	9.95	6.11	6.18	9.89	17.96	6.84	4.83
	2	6.92	6.17	6.39	5.81	8.79		
	3	7.98	7.76	6.78	5.39	9.54		
20	1	14.22	7.72	7.77	14.43	20.07	note 1	note 1
	2	8.66	7.05	6.85	8.29	9.68		
	3	5.86	6.06	5.92	5.91	6.31		
21	1	8.67	5.45	5.01	9.29	note 2	4.31	4.62
	2	4.71	4.73	4.71	4.80	4.90		
	3	4.77	4.67	4.76	4.85	4.82		
22	1	6.52	4.44	4.57	6.88	8.43	3.86	4.60
	2	4.67	4.30	4.57	4.34	5.27		
	3	4.63	3.99	4.40	3.98	5.14		
23	1	12.66	4.89	4.01	14.39	20.41	4.00	3.82
	2	3.86	3.77	3.15	4.39	7.47		
	3	2.67	2.53	2.84	2.74	2.94		
24	1	10.25	4.19	4.54	10.27	17.69	3.20	3.20
	2	5.87	3.97	4.35	4.80	8.34		
	3	5.29	3.66	4.28	4.14	6.37		
				Cobalt Alloys				
1	1	12.74	14.55	12.42	14.18	14.61	7.23	8.87
	2	11.83	8.09	9.31	12.52	9.89		
	3	note 2	8.32	8.24	note 2	note 2		
2	1	10.98	8.05	8.14	10.52	10.06	7.14	6.76
	2	10.93	7.74	8.11	10.50	10.07		
	3	note 2	note 2	note 2	note 2	note 2		
3	1	13.05	7.38	7.31	12.45	22.57	5.72	4.49
	2	8.83	7.28	7.15	8.74	11.51		
	3	4.76	4.83	4.62	5.08	4.83		
4	1	3.49	4.04	2.95	4.50	8.32	3.38	3.57
	2	2.76	3.10	2.69	3.38	3.08		
	3	3.14	2.68	2.30	3.57	2.53		
5	1	7.75	7.88	7.69	8.00	8.63	8.65	8.02
	2	7.69	7.78	7.71	7.75	7.73		
	3	7.63	7.85	7.52	7.97	7.62		
6	1	6.52	7.51	6.46	6.91	8.99	3.97	4.16
	2	6.24	5.94	6.71	6.30	5.98		
	3	6.07	6.00	6.93	6.18	5.76		
7	1	6.18	5.39	6.19	6.19	8.24	4.75	5.83
	2	5.96	5.27	5.99	5.36	5.99		
	3	5.45	5.01	5.55	4.98	5.80		
8	1	7.83	4.69	4.73	8.23	9.59	4.47	4.40
	2	5.41	4.75	4.72	5.29	5.83		
	3	4.93	4.70	4.72	4.78	5.00		
9	1	5.37	5.62	5.45	5.51	5.65	5.28	4.97
	2	5.47	5.44	5.42	5.49	5.40		

Table 9. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	3	4.70	4.50	4.58	4.65	4.55		
10	1	18.29	4.07	5.13	18.31	51.62	4.32	3.86
	2	7.01	4.39	4.08	4.84	10.11		
	3	note 2	3.60	3.87	7.48	10.90		
11	1	6.61	6.51	5.39	7.51	9.84	note 2	note 2
	2	4.58	4.32	4.22	5.07	4.38		
	3	4.28	4.19	4.44	4.59	4.25		
12	1	3.73	3.33	2.61	4.90	6.30	2.34	2.04
	2	2.54	2.80	2.79	2.56	2.94		
	3	2.72	2.75	2.62	2.91	3.34		
13	1	10.41	5.70	4.46	13.03	17.39	4.12	3.31
	2	3.55	3.55	3.67	3.58	3.81		
	3	3.57	3.53	3.42	4.15	4.00		
14	1	9.18	5.60	4.70	10.88	15.77	6.61	13.68
	2	5.16	4.17	4.73	4.50	7.96		
	3	5.15	4.13	4.67	4.03	6.25		
15	1	6.37	4.45	4.34	5.88	9.70	3.84	4.00
	2	4.84	4.32	4.34	4.35	6.46		
	3	4.34	4.29	4.23	4.24	4.72		
16	1	29.20	10.55	9.77	28.44	85.28	30.80	15.08
	2	11.71	10.51	9.89	11.53	18.02		
	3	7.85	8.73	7.98	8.10	8.65		
17	1	12.64	12.05	11.64	13.59	13.46	6.50	7.76
	2	7.82	8.08	7.94	8.10	7.88		
	3	9.18	8.16	8.31	9.12	8.86		
18	1	2.66	2.41	2.16	2.98	3.18	1.92	1.60
	2	2.07	2.08	2.05	2.06	2.05		
	3	2.15	note 2	2.41	2.13	2.21		

Note 1. Insufficient number of stress levels at each temperature to allow calculation.

Note 2. One data point outside stress range of master curve.

Table 10. Average Values of Average Deviation of Stress (Equation 25) for Each Complete Data Set: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	5.783	5.280	5.148	6.070	6.160	5.820	5.238
Rank	4	3	1	6	7	5	2
				Ferritic Steels			
Value	5.543	4.847	4.879	5.780	5.810	6.269	6.809
Rank	3	1	2	4	5	6	7
				Aluminum Alloys			
Value	4.822	4.745	4.093	5.295	6.747	6.801	7.544
Rank	3	2	1	4	5	6	7
				Nickel Alloys			
Value	6.309	5.425	5.317	5.976	7.327	4.892	5.449
Rank	6	3	2	5	7	1	4
				Cobalt Alloys			
Value	6.356	5.534	5.640	6.218	7.172	6.531	9.372
Rank	4	1	2	3	6	5	7
				All Data			
Value	5.707	5.127	4.969	5.845	6.550	6.068	6.704
Rank	3	2	1	4	6	5	7

Table 11. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Average Deviation of Stress; Second Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	2	2	8	0	1	9	5
2nd	0	6	8	3	1	1	10
3rd	5	8	3	3	6	1	2
4th	10	3	5	4	4	2	2
5th	5	4	2	7	4	3	3
6th	6	3	2	4	4	6	4
7th	1	0	1	8	9	7	3
Average	4.31	3.14	2.83	5.04	4.97	4.21	3.41
Rank	5	2	1	7	6	4	3
			Ferritic Steels				
1st	1	6	10	1	2	8	5
2nd	3	5	5	2	3	6	7
3rd	5	8	3	5	9	1	3
4th	9	4	6	9	2	4	0
5th	9	5	4	1	5	1	3
6th	5	3	2	9	3	8	3
7th	0	1	2	5	8	4	11
Average	4.16	3.31	3.09	4.69	4.44	3.75	4.31
Rank	4	2	1	7	6	3	5
			Aluminum Alloys				
1st	3	5	9	1	1	5	3
2nd	6	7	3	2	1	4	3
3rd	6	3	3	4	0	5	4
4th	6	2	6	5	1	3	3
5th	3	3	0	4	9	2	5
6th	2	2	4	6	3	3	4
7th	0	4	1	4	11	2	2
Average	3.23	3.50	3.04	4.65	5.65	3.41	4.00
Rank	2	4	1	6	7	3	5

Table 11. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	0	3	6	0	0	13	3
2nd	2	7	5	3	1	2	3
3rd	4	6	3	9	0	0	3
4th	7	4	6	1	3	0	3
5th	3	2	1	8	4	4	1
6th	7	1	1	3	2	1	5
7th	0	1	2	0	14	1	3
Average	4.21	3.08	3.08	3.96	6.00	2.38	4.10
Rank	6	2	2	3	7	1	5
			Cobalt Alloys				
1st	1	1	3	0	0	5	8
2nd	2	5	2	1	0	6	3
3rd	2	3	5	2	4	1	1
4th	3	5	3	3	2	0	1
5th	3	1	3	7	3	2	0
6th	6	2	1	3	3	0	2
7th	1	1	1	2	6	3	2
Average	4.50	3.55	3.44	4.83	5.28	3.00	2.76
Rank	5	4	3	6	7	2	1
			All Data				
1st	7	20	36	2	4	40	24
2nd	13	30	23	11	6	19	26
3rd	22	28	17	23	19	8	13
4th	35	18	26	22	12	9	9
5th	24	15	10	27	25	12	12
6th	26	11	10	25	15	18	18
7th	2	7	7	19	48	17	21
Average	4.10	3.30	3.07	4.64	5.21	3.45	3.79
Rank	5	2	1	6	7	3	4

Table 12. Average Values of Average Deviation of Stress (Equation 25) for Each Complete Data Set: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	5.012	4.060	4.208	5.213	4.828	5.820	5.238
Rank	4	1	2	5	3	7	6
				Ferritic Steels			
Value	4.794	3.548	4.042	4.367	4.164	6.269	6.809
Rank	5	1	2	4	3	6	7
				Aluminum Alloys			
Value	2.783	2.833	3.040	3.494	3.698	6.801	7.544
Rank	1	2	3	4	5	6	7
				Nickel Alloys			
Value	5.226	5.010	4.597	4.648	5.360	4.892	5.449
Rank	5	4	1	2	6	3	7
				Cobalt Alloys			
Value	5.061	5.236	5.083	5.248	5.579	6.531	9.372
Rank	1	3	2	4	5	6	7
				All Data			
Value	4.566	4.010	4.126	4.552	4.630	6.069	6.704
Rank	4	1	2	3	5	6	7

Table 13. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Average Deviation of Stress; Third Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	0	8	10	3	2	4	3
2nd	1	13	1	7	2	2	3
3rd	9	3	3	1	5	3	3
4th	7	1	8	2	6	1	3
5th	3	3	6	3	6	2	5
6th	7	0	0	5	5	6	5
7th	1	0	0	7	2	11	7
Average	4.32	2.21	2.96	4.36	4.25	4.97	4.62
Rank	4	1	2	5	3	7	6
			Ferritic Steels				
1st	1	14	12	3	3	2	1
2nd	5	4	4	0	7	5	4
3rd	4	4	7	6	6	3	3
4th	7	3	5	7	6	1	2
5th	9	5	1	6	6	1	1
6th	4	1	1	5	1	14	6
7th	1	0	1	3	1	6	15
Average	4.10	2.48	2.55	4.33	3.40	4.88	5.38
Rank	4	1	2	5	3	6	7
			Aluminum Alloys				
1st	9	4	9	1	1	1	1
2nd	8	9	4	1	5	0	0
3rd	6	6	2	4	3	4	1
4th	0	3	4	10	4	3	2
5th	0	4	2	5	9	3	2
6th	1	0	1	2	2	8	9
7th	0	0	3	2	2	5	9
Average	2.04	2.77	3.04	4.24	4.12	5.13	5.79
Rank	1	2	3	5	4	6	7

Table 13. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	4	5	2	3	0	8	3
2nd	2	6	3	6	2	2	2
3rd	3	4	9	4	5	0	0
4th	5	6	6	1	3	2	1
5th	4	2	2	5	5	2	3
6th	5	0	2	3	4	4	3
7th	1	1	0	2	5	3	9
Average	3.92	2.92	3.38	3.67	4.79	3.57	5.10
Rank	5	1	2	4	6	3	7
			Cobalt Alloys				
1st	1	3	2	1	0	5	6
2nd	0	1	4	1	4	4	4
3rd	3	5	6	2	1	0	0
4th	6	4	2	2	2	1	1
5th	2	3	1	4	4	1	0
6th	2	0	1	5	2	3	3
7th	1	0	1	1	3	3	3
Average	4.20	3.20	3.18	4.63	4.50	3.59	3.35
Rank	5	2	1	7	6	4	3
			All Data				
1st	15	34	35	11	6	20	14
2nd	16	33	16	15	20	13	13
3rd	25	22	27	17	20	10	7
4th	25	17	25	22	21	8	9
5th	18	17	12	23	30	9	11
6th	19	1	5	20	14	35	26
7th	4	1	5	15	13	28	43
Average	3.72	2.66	2.98	4.23	4.15	4.54	4.95
Rank	3	1	2	5	4	6	7

Table 14. Average Deviation of Rupture-Time (Equation 26) for Each Complete Data Set.

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1	32.18	35.88	22.67	45.52	50.64	22.06	15.82
	2	19.18	21.52	15.14	24.52	15.86		
	3	19.10	15.15	13.63	24.52	14.89		
2	1	38.69	34.37	42.22	33.29	40.47	23.50	29.30
	2	39.50	30.23	38.36	34.77	41.95		
	3	34.98	24.41	29.49	28.47	40.04		
3	1	32.57	18.51	25.60	33.74	46.50	17.52	12.73
	2	27.08	15.00	19.82	23.04	32.47		
	3	27.00	14.54	18.95	22.70	32.53		
4	1	44.49	43.85	44.69	43.56	44.99	46.57	47.86
	2	44.89	38.51	46.14	43.70	43.80		
	3	34.43	32.47	35.33	32.44	35.41		
5	1	41.75	49.30	39.58	49.10	46.03	32.42	34.85
	2	41.88	33.07	28.71	45.69	36.09		
	3	42.09	29.13	27.67	45.60	36.70		
6	1	49.87	41.93	30.51	58.73	75.00	24.52	29.13
	2	27.92	25.40	26.87	32.12	27.52		
	3	24.28	22.69	21.69	29.57	22.64		
7	1	72.11	27.97	38.69	82.68	87.47	27.15	16.98
	2	27.88	20.14	16.56	30.99	39.29		
	3	16.01	15.95	13.54	16.48	20.19		
8	1	38.52	22.19	14.83	45.77	51.07	17.42	13.27
	2	15.13	13.48	13.37	14.51	20.88		
	3	13.80	12.70	13.35	12.66	16.10		
9	1	17.87	21.47	16.91	20.74	28.33	22.58	20.34
	2	16.66	18.81	17.74	19.16	18.33		
	3	16.86	16.13	13.79	20.00	14.11		
10	1	65.90	49.16	47.73	77.58	92.85	55.51	54.98
	2	51.37	48.01	47.74	51.94	59.18		
	3	39.80	37.64	40.67	37.74	40.36		
11	1	69.42	90.99	61.93	97.77	96.72	56.00	60.96
	2	61.50	64.97	53.64	76.45	54.25		
	3	53.98	44.16	44.73	68.51	45.09		
12	1	54.68	45.50	37.78	52.61	41.52	34.29	31.74
	2	51.20	33.69	30.12	52.22	41.40		
	3	49.81	23.31	22.81	51.64	40.66		
13	1	48.21	51.56	38.17	59.04	69.41	17.33	25.31
	2	29.22	27.63	24.88	35.29	24.95		
	3	28.40	17.43	21.48	34.32	21.99		
14	1	37.58	31.15	26.24	43.98	47.33	20.56	24.76
	2	22.22	24.51	21.57	24.18	22.89		
	3	21.05	21.70	20.32	22.09	20.62		
15	1	116.93	55.40	46.07	155.03	198.60	42.93	86.55
	2	40.34	41.75	39.11	40.75	52.12		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	3	37.90	38.44	38.21	39.31	39.74		
16	1	41.70	34.61	29.98	50.92	69.97	22.65	29.38
	2	25.42	23.64	27.15	24.36	29.36		
	3	25.95	21.99	27.78	23.79	26.30		
17	1	34.78	37.85	31.85	42.48	45.34	36.18	27.33
	2	28.92	28.70	26.57	31.95	26.80		
	3	28.86	26.64	25.90	31.90	25.99		
18	1	162.43	147.64	153.22	163.72	165.39	note 2	note 2
	2	89.35	80.17	92.38	81.70	88.71		
	3	84.47	79.15	86.73	78.46	85.21		
19	1	106.00	56.80	51.05	116.29	139.44	38.04	53.08
	2	46.99	41.35	41.67	47.09	55.65		
	3	33.50	32.48	34.50	32.79	34.66		
20	1	24.72	31.58	24.68	36.47	57.03	32.58	23.41
	2	25.24	24.71	24.75	27.28	25.61		
	3	23.24	24.16	23.42	24.40	25.62		
21	1	148.54	51.37	43.30	160.14	226.25	50.80	61.45
	2	42.57	43.42	37.60	47.57	57.10		
	3	27.86	27.54	28.18	28.22	28.78		
22	1	42.23	50.67	30.77	51.26	73.83	26.95	38.98
	2	38.56	34.86	35.67	44.38	34.89		
	3	38.49	31.86	35.62	44.40	34.34		
23	1	163.80	123.07	77.01	213.98	322.26	19.14	30.46
	2	60.46	79.58	54.27	80.42	67.23		
	3	57.37	52.90	44.10	78.00	46.09		
24	1	97.23	89.87	89.72	91.43	89.83	55.03	152.17
	2	97.04	66.86	74.72	90.87	87.75		
	3	94.06	47.44	53.22	89.25	85.55		
25	1	36.39	40.06	33.46	44.73	49.86	30.73	28.43
	2	31.99	31.58	28.37	34.54	29.98		
	3	31.06	25.68	24.95	33.65	27.98		
26	1	40.08	34.67	29.42	50.61	50.32	38.27	30.17
	2	31.87	31.46	29.20	32.81	34.29		
	3	28.18	28.83	28.00	29.09	29.46		
27	1	72.81	43.14	40.81	85.40	95.97	17.47	22.65
	2	31.96	31.68	27.11	35.50	36.65		
	3	15.22	16.94	14.88	16.18	16.72		
28	1	34.92	26.54	23.07	42.93	45.39	27.24	23.82
	2	22.55	22.43	22.84	23.23	24.04		
	3	19.40	18.31	19.78	18.49	19.53		
29	1	14.84	12.14	13.27	13.15	13.41	24.37	12.18
	2	10.68	10.98	11.07	10.91	11.29		
	3	10.25	10.89	10.68	10.67	11.07		
				Ferritic Steels				
1	1	28.38	29.05	23.75	32.95	39.91	14.00	18.51

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	2	20.44	19.08	19.30	22.37	18.88		
	3	20.25	17.96	19.30	21.85	18.76		
2	1	156.97	64.47	103.96	172.90	194.77	25.32	31.92
	2	30.75	35.33	27.06	36.18	41.94		
	3	23.72	24.02	21.44	28.39	21.21		
3	1	38.65	33.37	35.24	37.61	45.11	35.43	47.66
	2	29.98	26.38	31.66	27.86	29.26		
	3	28.23	25.70	29.22	25.53	29.10		
4	1	32.95	37.12	29.80	38.04	34.64	17.50	24.70
	2	23.90	20.77	17.08	28.10	20.28		
	3	22.84	18.44	15.45	27.36	18.68		
5	1	45.04	44.25	41.50	45.72	60.93	60.33	54.13
	2	40.12	40.06	41.44	41.49	41.27		
	3	38.57	37.40	38.08	37.40	40.50		
6	1	92.44	62.43	65.73	99.37	108.70	30.63	46.22
	2	33.91	31.10	29.99	35.21	43.01		
	3	22.37	21.64	23.42	21.65	24.85		
7	1	68.06	60.17	60.84	71.04	77.01	73.75	116.46
	2	47.59	43.61	43.99	46.68	44.68		
	3	40.67	36.68	36.56	40.10	37.13		
8	1	135.40	95.28	105.69	153.85	157.13	36.26	123.40
	2	39.20	39.24	33.60	44.52	43.27		
	3	32.87	35.47	31.79	35.82	34.06		
9	1	35.76	29.87	30.05	40.25	40.24	28.38	30.75
	2	26.96	26.60	26.60	26.72	26.71		
	3	26.91	27.65	27.43	26.83	26.82		
10	1	208.83	131.91	110.72	223.12	342.23	276.16	493.25
	2	80.09	89.25	76.92	90.36	83.77		
	3	57.20	50.45	45.40	62.20	49.21		
11	1	4440.00	2532.50	3045.00	5342.00	5253.10	310.88	884.64
	2	323.49	360.57	254.91	420.50	403.67		
	3	148.81	162.68	124.30	179.23	134.17		
12	1	57.31	46.17	38.10	61.78	75.71	12.17	28.03
	2	14.34	14.25	12.68	17.54	12.51		
	3	13.66	10.88	12.46	16.19	11.94		
13	1	103.70	87.06	75.84	117.69	125.76	18.41	57.83
	2	21.73	12.33	13.16	23.07	12.44		
	3	18.20	9.00	12.93	21.40	12.13		
14	1	77.24	53.86	54.34	81.53	91.89	32.83	31.45
	2	36.37	35.73	31.07	37.87	44.36		
	3	29.20	29.25	27.93	32.79	28.57		
15	1	99.13	46.03	52.93	113.34	123.06	26.86	28.24
	2	24.12	25.99	23.59	26.42	27.83		
	3	23.94	24.51	24.17	25.18	24.33		
16	1	171.55	105.17	105.54	209.90	223.46	37.25	89.61
	2	55.50	49.55	49.88	54.15	51.08		
	3	53.75	33.92	39.79	51.38	48.20		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
17	1	314.80	271.27	184.06	439.03	476.60	169.62	281.99
	2	75.98	93.23	70.50	93.30	76.85		
	3	53.72	53.93	46.79	61.45	48.10		
18	1	124.57	70.97	86.36	124.77	145.02	51.51	69.96
	2	63.03	54.59	50.67	65.26	77.58		
	3	36.22	38.85	35.16	40.24	35.14		
19	1	111.91	89.29	103.29	116.21	116.57	37.00	51.25
	2	40.95	42.82	39.73	43.74	41.94		
	3	31.31	24.41	22.89	31.32	29.50		
20	1	41.42	24.50	36.31	50.22	68.42	41.24	27.00
	2	40.34	22.76	25.47	31.65	52.15		
	3	41.75	15.34	17.11	32.26	51.64		
21	1	108.99	67.89	46.03	100.58	216.95	32.66	39.40
	2	37.79	46.95	34.53	47.45	58.10		
	3	25.71	30.13	22.98	38.61	27.72		
22	1	165.12	113.22	141.90	177.70	176.97	35.99	47.52
	2	45.50	40.36	38.22	50.12	58.19		
	3	35.05	32.66	33.73	34.66	32.82		
23	1	52.92	39.24	38.17	57.96	63.34	18.75	15.17
	2	37.00	37.52	36.64	37.20	39.77		
	3	37.09	37.24	36.45	37.21	38.89		
24	1	20.53	20.21	13.04	30.29	34.99	18.39	9.98
	2	11.84	13.74	9.82	14.92	10.59		
	3	9.77	10.30	9.10	12.13	9.27		
25	1	16.07	13.39	15.91	13.00	15.14	13.10	12.45
	2	14.61	12.54	15.41	12.93	14.35		
	3	14.79	12.68	15.65	13.05	14.50		
26	1	32.43	30.53	26.60	34.29	28.99	24.08	22.99
	2	33.03	21.76	20.54	34.31	28.61		
	3	24.63	19.95	19.06	25.29	21.88		
27	1	84.66	46.20	69.08	93.01	93.00	18.14	29.19
	2	41.31	14.90	29.25	47.47	47.27		
	3	36.04	15.11	26.79	40.50	40.50		
28	1	122.56	86.77	91.29	112.17	112.17	45.56	88.38
	2	121.74	56.74	52.86	112.17	112.17		
	3	87.87	46.85	38.51	81.17	81.17		
29	1	73.01	33.48	55.76	82.66	82.66	42.18	25.11
	2	43.53	28.87	35.88	47.53	47.53		
	3	33.78	22.80	29.05	36.16	36.16		
30	1	86.60	68.40	76.74	92.77	92.76	80.33	67.72
	2	76.95	68.35	73.19	78.99	78.99		
	3	71.78	62.65	62.87	73.56	73.55		
31	1	139.53	113.80	121.75	152.93	152.93	60.70	111.82
	2	73.12	70.80	70.59	69.88	69.87		
	3	75.75	59.33	59.45	70.58	70.58		
32	1	186.99	132.73	155.43	205.99	205.98	69.52	94.08
	2	66.64	67.90	68.03	69.10	69.10		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
	3	64.27	65.90	65.68	64.89	64.88		
				Aluminum Alloys				
1	1	316.19	157.19	84.45	350.46	369.24	150.95	296.86
	2	157.06	123.55	63.10	184.08	257.97		
	3	52.75	69.69	50.60	70.03	96.93		
2	1	122.71	80.04	56.42	149.68	166.46	57.56	119.16
	2	36.24	35.52	36.88	37.84	33.87		
	3	35.17	24.27	37.82	36.55	32.55		
3	1	1223.40	635.06	784.60	1538.30	1301.18	223.65	258.91
	2	506.2	625.52	425.58	610.58	474.08		
	3	388.64	238.90	215.40	430.75	299.35		
4	1	430.54	168.27	92.08	469.56	519.29	note 2	note 2
	2	169.34	118.83	49.09	194.24	371.61		
	3	61.81	81.79	29.52	81.24	102.79		
5	1	63.82	46.59	23.82	84.62	94.46	13.82	21.12
	2	15.71	25.54	22.90	26.45	18.76		
	3	14.31	7.72	20.79	21.42	11.63		
6	1	73.48	47.71	34.28	98.44	104.20	22.05	28.06
	2	16.52	17.68	31.35	17.85	24.10		
	3	16.55	15.02	21.77	16.99	17.57		
7	1	55.84	39.07	42.58	90.07	97.61	24.28	36.39
	2	26.45	22.91	42.05	23.51	33.08		
	3	25.54	19.42	43.03	20.79	26.19		
8	1	362.91	143.89	59.28	385.41	432.20	24.69	28.92
	2	114.71	60.52	42.03	139.02	323.20		
	3	30.62	47.44	27.31	46.88	54.58		
9	1	188.34	151.91	105.76	214.40	230.91	note 2	note 2
	2	96.48	104.28	80.07	103.38	135.22		
	3	45.54	58.82	51.21	62.17	66.96		
10	1	54.81	63.53	41.25	94.17	153.98	39.97	38.76
	2	43.47	52.71	39.98	54.22	43.08		
	3	43.25	44.54	40.27	54.10	40.71		
11	1	55.60	84.32	35.78	91.86	149.24	37.13	49.37
	2	38.09	54.86	35.24	61.48	50.56		
	3	19.82	18.90	33.60	38.38	25.40		
12	1	64.84	82.84	37.10	89.66	197.03	31.00	30.27
	2	53.32	70.41	29.96	73.47	57.88		
	3	22.87	25.29	13.31	32.39	19.66		
13	1	265.95	82.14	56.25	336.27	416.10	50.69	62.94
	2	58.05	63.17	56.11	69.56	103.59		
	3	50.79	49.90	53.74	49.86	73.62		
14	1	1516.12	551.65	250.61	1750.00	2129.70	note 2	note 2
	2	551.64	457.10	252.85	643.24	927.54		
	3	260.70	310.30	154.35	321.98	352.00		
15	1	212.85	103.46	46.17	305.04	410.25	31.63	49.06
	2	61.75	78.43	39.80	84.80	98.27		
	3	26.70	36.27	34.08	37.81	37.63		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
16	1	891.23	286.72	143.81	1259.10	1699.10	195.99	475.76
	2	161.59	204.96	109.80	215.30	223.36		
	3	114.34	133.98	93.48	137.29	113.55		
17	1	1242.00	443.60	77.11	1384.00	1367.57	note 2	note 2
	2	497.40	258.00	49.48	670.40	1142.11		
	3	128.90	197.96	37.64	211.70	232.15		
18	1	92.54	40.99	57.00	79.26	129.47	25.43	40.79
	2	53.72	38.80	58.86	41.60	82.88		
	3	26.69	27.23	15.17	27.54	52.63		
19	1	217.82	191.70	143.55	245.81	356.38	note 2	note 2
	2	158.98	180.50	137.34	179.91	201.90		
	3	70.39	84.04	47.91	84.50	97.47		
20	1	223.30	109.90	60.26	285.60	345.12	48.54	68.67
	2	36.37	42.10	46.91	42.15	60.15		
	3	34.85	41.18	38.18	44.44	46.26		
21	1	130.66	72.13	36.58	165.29	191.76	32.83	41.23
	2	37.76	43.76	29.71	49.03	74.33		
	3	20.39	28.81	25.95	32.53	30.43		
22	1	95.60	75.85	34.21	129.79	207.77	23.86	39.66
	2	43.15	60.48	31.83	60.38	49.54		
	3	32.06	21.40	31.45	48.28	17.91		
23	1	85.81	47.16	43.18	96.98	192.31	23.23	28.32
	2	23.66	32.65	32.51	31.98	43.42		
	3	21.35	20.95	31.92	27.66	26.93		
24	1	179.70	124.10	101.05	245.50	281.21	96.41	157.60
	2	52.05	52.11	80.02	51.63	96.05		
	3	51.68	42.06	63.03	51.08	55.92		
25	1	71.11	46.51	50.35	67.89	81.84	244.28	307.52
	2	47.55	44.25	37.76	48.71	66.88		
	3	39.24	36.19	37.64	42.36	33.14		
26	1	176.37	167.25	135.47	169.72	223.35	87.69	89.03
	2	122.55	115.47	131.67	118.29	200.85		
	3	124.00	116.62	122.70	115.40	167.11		
				Nickel Alloys				
1	1	60.70	40.02	39.15	68.69	88.36	20.40	41.27
	2	33.71	32.49	33.75	32.61	38.23		
	3	29.70	27.89	30.72	27.95	31.57		
2	1	77.41	48.23	34.60	90.74	116.99	32.79	34.67
	2	33.97	35.34	28.02	37.97	46.78		
	3	17.18	20.37	17.30	21.59	18.74		
3	1	119.12	50.46	55.31	138.69	152.76	11.78	25.25
	2	15.98	18.55	12.48	20.23	28.03		
	3	9.83	9.89	10.88	13.77	12.16		
4	1	28.23	18.13	15.34	32.47	40.99	11.54	16.88
	2	11.62	7.23	13.09	7.39	16.93		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
5	3	35.69	29.96	29.66	33.13	37.38		
6	1	57.74	54.40	52.23	63.32	68.64	36.91	51.43
	2	42.03	40.51	40.66	42.07	40.72		
	3	42.06	38.90	42.02	41.91	40.36		
7	1	130.60	87.41	81.85	145.31	190.29	85.67	119.95
	2	65.83	64.33	65.44	65.20	70.37		
	3	51.46	47.15	52.95	46.71	54.90		
8	1	92.50	47.15	38.08	111.27	125.18	21.38	35.06
	2	34.86	34.41	31.91	37.18	38.66		
	3	18.72	19.83	18.62	19.79	18.75		
9	1	57.39	46.45	42.80	55.53	87.96	28.59	45.85
	2	35.50	30.54	37.33	34.04	36.30		
	3	35.34	24.14	35.11	34.40	32.54		
10	1	183.03	96.18	84.64	168.40	244.65	296.78	1064.00
	2	71.26	75.95	62.87	78.05	91.40		
	3	52.25	59.82	47.65	63.62	49.82		
11	1	291.16	76.85	46.87	292.10	414.97	note 1	note 1
	2	58.17	40.88	27.34	52.05	113.34		
	3	35.25	28.20	27.28	26.74	60.15		
12	1	17.67	25.03	17.45	26.64	30.61	26.83	18.96
	2	16.96	14.50	15.33	20.92	14.39		
	3	16.98	14.31	14.78	20.92	13.98		
13	1	30.17	26.65	24.36	33.31	33.99	10.28	24.47
	2	13.71	11.70	11.99	12.54	12.07		
	3	13.63	10.36	11.75	12.52	12.04		
14	1	61.97	36.46	32.79	70.07	85.18	22.30	33.62
	2	23.09	25.27	22.43	25.32	27.15		
	3	17.54	17.31	18.10	16.87	18.91		
15	1	89.01	26.27	19.30	101.96	117.92	10.67	18.04
	2	21.34	16.87	14.75	22.04	32.77		
	3	16.50	12.81	14.57	12.96	21.60		
16	1	105.32	98.02	83.09	124.47	134.51	39.89	92.97
	2	55.28	57.61	53.55	58.90	56.31		
	3	49.94	42.18	42.99	51.61	43.39		
17	1	51.98	44.85	40.13	56.83	68.39	34.90	40.27
	2	34.75	37.65	34.51	37.36	34.72		
	3	33.58	31.07	28.98	36.28	31.79		
18	1	68.99	35.87	28.85	79.27	100.68	30.81	43.47
	2	21.75	24.03	21.81	22.76	31.88		
	3	20.42	19.42	20.72	19.41	26.61		
19	1	68.87	35.89	30.42	66.58	134.98	54.40	33.70
	2	29.66	27.60	30.32	29.01	30.43		
	3	29.28	26.56	29.60	28.14	31.21		
20	1	90.84	69.70	68.68	91.68	103.38	note 1	note 1
	2	70.38	67.16	65.43	70.18	77.55		
	3	62.42	64.79	63.08	63.53	65.07		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
21	1	43.18	27.42	24.97	44.75	110.14	24.62	25.08
	2	23.28	23.82	23.00	24.52	24.17		
	3	23.60	23.71	23.27	24.80	23.41		
22	1	56.00	36.54	38.62	59.24	71.81	32.14	39.36
	2	41.08	36.06	36.82	37.04	46.56		
	3	39.80	33.39	36.87	33.89	43.87		
23	1	90.17	40.68	33.57	100.86	124.64	29.46	30.11
	2	30.55	28.96	25.15	32.21	47.71		
	3	21.80	18.99	23.23	22.63	22.43		
24	1	74.02	24.25	26.02	71.59	133.88	19.64	19.76
	2	29.23	22.15	23.37	24.68	35.45		
	3	29.37	21.60	24.16	24.29	34.00		
				Cobalt Alloys				
1	1	52.83	58.47	51.53	57.98	57.09	21.41	40.43
	2	49.05	31.80	31.83	52.04	36.93		
	3	40.47	31.83	30.89	42.59	34.60		
2	1	53.62	42.92	43.83	52.41	50.93	50.11	64.94
	2	53.97	39.55	41.59	52.50	50.84		
	3	45.00	38.84	37.35	43.87	42.85		
3	1	50.04	29.72	28.93	48.16	64.72	26.89	20.85
	2	30.92	29.15	28.40	31.39	36.63		
	3	20.89	18.57	20.68	21.79	22.05		
4	1	36.05	36.70	29.56	46.75	86.88	28.97	38.89
	2	27.77	30.75	26.89	31.31	29.44		
	3	28.79	24.73	19.07	32.07	23.05		
5	1	66.26	67.28	63.82	69.38	76.77	96.13	87.56
	2	63.93	66.18	63.91	65.93	64.57		
	3	63.25	65.99	62.30	65.84	63.13		
6	1	74.61	77.76	73.95	76.70	81.77	80.82	117.50
	2	74.78	68.48	69.42	75.92	70.19		
	3	75.03	58.64	61.42	75.63	70.11		
7	1	59.65	53.06	61.36	59.33	74.30	52.16	87.16
	2	59.18	52.25	58.76	52.67	59.89		
	3	55.09	50.10	56.56	49.97	57.50		
8	1	35.54	26.58	26.91	36.34	39.09	31.94	33.05
	2	28.08	26.69	26.89	27.46	28.84		
	3	28.07	26.05	26.76	27.38	28.42		
9	1	44.10	45.29	45.09	44.18	46.01	49.58	55.26
	2	45.46	44.53	45.19	45.04	44.80		
	3	39.86	38.78	39.43	39.47	39.22		
10	1	95.35	35.79	42.58	96.75	120.44	38.95	33.23
	2	47.33	34.71	34.49	39.20	55.22		
	3	47.51	31.37	31.73	39.12	53.05		
11	1	45.05	46.55	40.82	49.50	56.38	note 2	note 2
	2	38.16	33.46	35.26	40.84	34.92		

Table 14. (Contd.)

Code	M	L-M	M-H	S-G	M-S	S-D	C	K
11	3	34.62	34.08	34.87	35.24	35.27		
12	1	26.68	26.05	19.60	35.80	43.00	15.94	15.39
	2	18.80	19.35	19.52	19.14	20.04		
	3	19.27	18.94	19.11	20.39	20.44		
13	1	49.46	29.81	23.70	56.35	68.81	22.96	21.40
	2	19.19	17.14	19.21	19.87	19.18		
	3	17.32	17.54	17.54	19.66	19.15		
14	1	93.78	49.90	46.20	129.48	181.44	54.07	101.04
	2	46.08	38.31	46.45	38.64	58.30		
	3	45.88	37.38	45.22	37.00	52.44		
15	1	32.57	26.18	26.14	30.49	40.38	28.94	28.22
	2	28.40	25.91	26.04	26.33	33.56		
	3	25.73	25.54	25.67	26.67	26.67		
16	1	80.12	55.10	54.04	80.56	83.20	84.99	90.52
	2	59.44	53.51	52.53	60.55	71.38		
	3	46.20	44.22	42.84	46.82	50.98		
17	1	62.67	60.97	58.18	66.44	65.18	29.36	41.06
	2	41.51	41.34	38.73	42.59	40.02		
	3	42.26	35.61	34.24	42.04	39.87		
18	1	32.81	27.60	25.22	37.24	41.31	21.15	20.15
	2	21.75	19.73	21.03	21.12	21.11		
	3	20.59	18.77	19.13	20.63	19.26		

Note 1. Insufficient number of stress levels at each temperature to allow calculation.

Note 2. One data point outside of stress range of master curve.

Table 15. Average Values of Average Deviation of Rupture-Time (Equation 26) for Each Complete Data Set: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	37.92	34.76	33.56	40.07	39.32	31.42	37.07
Rank	5	3	2	7	6	1	4
				Ferritic Steels			
Value	52.31	48.86	43.86	57.34	57.19	56.12	96.90
Rank	3	2	1	6	5	4	7
				Aluminum Alloys			
Value	122.30	114.77	76.57	147.43	199.77	70.75	108.02
Rank	5	4	2	6	7	1	3
				Nickel Alloys			
Value	35.77	33.37	31.78	35.88	43.32	41.48	85.47
Rank	3	2	1	4	6	5	7
				Cobalt Alloys			
Value	41.88	37.38	38.12	41.30	43.10	43.20	52.80
Rank	4	1	2	3	5	6	7
				All Data			
Value	58.64	54.49	45.08	65.38	77.31	48.40	76.54
Rank	4	3	1	5	7	2	6

Table 16. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Average Deviation of Rupture-Time; Second Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	2	3	11	0	0	10	3
2nd	3	8	4	3	2	1	8
3rd	2	8	6	2	8	2	1
4th	8	4	4	5	2	3	3
5th	7	3	4	6	5	2	2
6th	7	3	0	4	5	4	5
7th	0	0	0	9	7	6	6
Average	4.24	3.17	2.52	5.14	4.83	3.78	4.14
Rank	5	2	1	7	6	3	4
			Ferritic Steels				
1st	1	7	12	0	0	9	4
2nd	3	6	7	1	4	7	3
3rd	6	5	7	2	8	1	3
4th	7	8	3	5	3	4	3
5th	9	5	2	9	6	1	1
6th	5	1	0	12	4	7	3
7th	1	0	1	3	7	3	15
Average	4.22	3.03	2.38	5.19	4.60	3.44	4.97
Rank	4	2	1	7	5	3	6
			Aluminum Alloys				
1st	2	1	11	1	1	9	1
2nd	6	8	4	1	0	3	4
3rd	7	2	3	3	2	4	5
4th	6	4	3	7	2	1	3
5th	5	3	2	4	11	1	0
6th	0	5	2	6	3	3	2
7th	0	3	1	4	7	0	6
Average	3.23	4.08	2.65	4.77	5.27	2.51	4.29
Rank	3	4	2	6	7	1	5

Table 16. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	1	3	7	0	1	11	1
2nd	2	10	6	3	1	1	1
3rd	7	5	5	6	0	1	0
4th	7	4	3	1	3	3	3
5th	3	1	2	7	7	1	3
6th	4	1	1	7	3	3	3
7th	0	0	0	0	9	2	11
Average	3.88	2.71	2.58	4.38	5.46	2.95	5.68
Rank	4	2	1	5	6	3	7
			Cobalt Alloys				
1st	0	8	3	0	1	3	3
2nd	2	4	5	2	2	2	1
3rd	4	1	5	3	3	2	0
4th	4	3	4	3	3	1	0
5th	4	2	1	5	4	1	1
6th	3	0	0	3	1	6	4
7th	1	0	0	2	4	2	8
Average	4.28	2.28	2.72	4.56	4.44	4.24	5.29
Rank	4	1	2	6	5	3	7
			All Data				
1st	6	22	44	1	3	42	12
2nd	16	36	26	10	9	14	17
3rd	26	21	26	16	21	10	9
4th	32	23	17	21	13	12	12
5th	28	14	11	31	33	6	7
6th	19	10	3	32	16	23	17
7th	2	3	2	18	34	13	46
Average	3.97	3.10	2.55	4.85	4.92	3.39	4.83
Rank	4	2	1	6	7	3	5

Table 17. Average Values of Average Deviation of Rupture-Time (Equation 26) for Each Complete Data Set: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	33.70	27.95	28.74	35.36	32.36	31.42	37.07
Rank	5	1	2	6	4	3	7
				Ferritic Steels			
Value	40.02	34.81	33.64	42.07	38.61	56.12	96.90
Rank	4	2	1	5	3	6	7
				Aluminum Alloys			
Value	67.65	69.19	52.76	82.47	81.96	70.75	108.02
Rank	2	3	1	6	5	4	7
				Nickel Alloys			
Value	29.72	27.07	28.05	29.36	36.32	41.48	85.47
Rank	4	1	2	3	5	6	7
				Cobalt Alloys			
Value	38.66	34.28	34.69	38.05	38.78	43.20	52.80
Rank	4	1	2	3	5	6	7
				All Data			
Value	42.06	38.68	35.50	45.78	45.45	48.40	76.54
Rank	3	2	1	5	4	6	7

Table 18. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Average Deviation of Rupture-Time; Third Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	3	7	11	3	0	4	1
2nd	3	11	3	4	4	2	2
3rd	6	6	5	3	4	3	2
4th	5	2	5	4	7	1	5
5th	4	3	4	4	9	3	2
6th	8	0	1	3	3	5	8
7th	0	0	0	8	2	10	8
Average	3.07	2.41	2.69	4.48	4.31	4.86	5.18
Rank	3	1	2	5	4	6	7
			Ferritic Steels				
1st	2	11	12	2	3	1	2
2nd	2	6	5	2	9	5	2
3rd	9	3	8	2	6	2	2
4th	7	8	4	5	6	1	3
5th	5	3	2	10	5	5	1
6th	7	1	0	8	1	13	2
7th	0	0	1	3	2	5	20
Average	4.00	2.66	2.47	4.72	3.38	4.97	5.66
Rank	4	2	1	5	3	6	7
			Aluminum Alloys				
1st	4	7	9	1	2	2	1
2nd	8	3	4	2	4	4	1
3rd	5	8	3	3	1	5	1
4th	5	6	2	7	5	0	1
5th	2	0	6	6	10	1	1
6th	2	2	0	2	1	9	5
7th	0	0	2	5	3	0	11
Average	2.96	2.81	3.00	4.58	4.23	4.00	5.81
Rank	2	1	3	6	5	4	7

Table 18. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	3	3	4	5	1	7	1
2nd	2	13	4	1	2	1	1
3rd	7	3	5	4	5	0	0
4th	4	4	8	3	3	2	0
5th	3	1	3	6	7	3	1
6th	5	0	0	5	3	7	2
7th	0	0	0	0	3	2	17
Average	3.71	2.46	3.08	3.79	4.42	4.00	6.32
Rank	3	1	2	4	6	5	7
			Cobalt Alloys				
1st	1	7	5	2	0	2	1
2nd	1	6	8	0	3	1	0
3rd	2	4	3	2	3	1	2
4th	7	0	1	5	3	1	1
5th	4	1	1	4	5	1	2
6th	2	0	0	4	2	7	2
7th	1	0	0	1	2	4	9
Average	4.22	2.00	2.17	4.39	4.33	5.06	5.65
Rank	3	1	2	5	4	6	7
			All Data				
1st	13	35	41	13	6	16	6
2nd	16	39	24	9	22	13	6
3rd	29	24	24	14	19	11	7
4th	28	20	20	24	24	5	10
5th	18	8	16	30	36	13	7
6th	24	3	1	22	10	41	19
7th	1	0	3	17	12	21	65
Average	3.76	2.50	2.70	4.42	4.09	4.61	5.69
Rank	3	1	2	5	4	6	7

Table 19. Average Values of Square Root of Adjusted Mean Square (Square Root of Equation 29) for Each Complete Data Set: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	0.194	0.177	0.175	0.200	0.199	0.182	0.195
Rank	4	2	1	7	6	3	5
				Ferritic Steels			
Value	0.219	0.212	0.196	0.228	0.229	0.223	0.277
Rank	3	2	1	5	6	4	7
				Aluminum Alloys			
Value	0.329	0.323	0.262	0.356	0.420	0.462	0.502
Rank	3	2	1	4	5	6	7
				Nickel Alloys			
Value	0.175	0.164	0.159	0.175	0.203	0.174	0.210
Rank	4	2	1	5	6	3	7
				Cobalt Alloys			
Value	0.205	0.187	0.189	0.204	0.209	0.236	0.224
Rank	4	1	2	3	5	7	6
				All Data			
Value	0.225	0.212	0.197	0.234	0.253	0.256	0.285
Rank	3	2	1	4	5	6	7

Table 20. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Square Root of Adjusted Mean Square; Second Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	0	5	12	1	0	10	1
2nd	0	9	5	3	4	0	8
3rd	8	7	5	2	3	1	3
4th	11	1	3	3	4	4	4
5th	4	6	4	5	5	3	2
6th	6	1	0	6	4	4	7
7th	0	0	0	9	9	7	4
Average	4.28	2.90	2.38	5.14	5.00	4.03	4.21
Rank	5	2	1	7	6	3	4
			Ferritic Steels				
1st	1	8	12	0	0	10	3
2nd	4	8	8	1	3	5	1
3rd	7	6	8	2	7	0	4
4th	6	6	2	7	5	3	3
5th	8	4	1	7	5	4	2
6th	5	0	0	12	4	7	5
7th	1	0	1	3	8	3	14
Average	4.09	2.69	2.25	5.12	4.75	3.59	5.22
Rank	4	2	1	6	5	3	7
			Aluminum Alloys				
1st	3	2	11	0	1	8	1
2nd	3	7	5	3	0	4	4
3rd	7	4	4	3	1	3	4
4th	8	6	1	5	2	2	3
5th	3	3	1	5	12	1	0
6th	2	4	1	6	2	7	4
7th	0	0	3	4	8	1	10
Average	3.42	3.50	2.65	4.77	5.38	3.35	4.88
Rank	3	4	1	5	7	2	6

Table 20. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	0	2	9	1	1	11	1
2nd	4	12	5	1	1	0	1
3rd	7	6	3	5	1	1	0
4th	5	2	4	6	2	2	3
5th	3	2	2	9	7	2	0
6th	5	0	1	2	4	4	5
7th	0	0	0	0	8	2	12
Average	3.92	2.58	2.50	4.12	5.38	3.18	5.86
Rank	4	2	1	5	6	3	7
			Cobalt Alloys				
1st	0	9	4	0	0	4	1
2nd	1	3	7	3	2	1	2
3rd	4	2	1	5	4	1	0
4th	6	2	3	0	5	1	1
5th	4	1	3	4	3	2	2
6th	3	1	0	3	2	6	1
7th	0	0	0	3	2	2	10
Average	4.22	2.22	2.67	4.44	4.28	4.30	5.59
Rank	3	1	2	6	4	5	7
			All Data				
1st	4	26	48	2	2	43	7
2nd	12	39	30	11	10	10	16
3rd	33	25	21	17	16	6	11
4th	36	17	13	21	18	12	14
5th	22	16	11	30	32	12	6
6th	21	6	2	29	16	28	22
7th	1	0	4	19	35	15	50
Average	3.98	2.81	2.47	4.78	4.98	3.67	5.08
Rank	4	2	1	5	6	3	7

Table 21. Average Values of Square Root of Adjusted Mean Square (Square Root of Equation 29) for Each Complete Data Set: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	0.176	0.153	0.157	0.181	0.173	0.182	0.195
Rank	4	1	2	5	3	6	7
				Ferritic Steels			
Value	0.193	0.168	0.169	0.201	0.189	0.223	0.277
Rank	4	1	2	5	3	6	7
				Aluminum Alloys			
Value	0.231	0.244	0.216	0.270	0.261	0.462	0.502
Rank	2	3	1	5	4	6	7
				Nickel Alloys			
Value	0.152	0.139	0.144	0.149	0.172	0.174	0.210
Rank	4	1	2	3	5	6	7
				Cobalt Alloys			
Value	0.191	0.174	0.177	0.191	0.191	0.236	0.224
Rank	3	1	2	3	3	6	7
				All Data			
Value	0.189	0.175	0.172	0.199	0.197	0.256	0.285
Rank	3	2	1	5	4	6	7

Table 22. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Square Root of Adjusted Mean Square; Third Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	2	8	11	3	1	3	1
2nd	1	13	4	4	3	2	2
3rd	9	4	4	2	7	3	1
4th	6	3	7	2	4	1	5
5th	4	1	3	6	8	2	5
6th	7	0	0	4	4	8	6
7th	0	0	0	8	2	10	9
Average	4.03	2.17	2.55	4.66	4.21	5.10	5.24
Rank	3	1	2	5	4	6	7
			Ferritic Steels				
1st	0	13	16	1	2	3	1
2nd	4	8	4	0	7	4	1
3rd	4	5	7	6	9	0	4
4th	10	4	2	6	6	1	2
5th	8	2	2	9	4	4	2
6th	5	0	0	7	2	14	4
7th	1	0	1	3	2	6	18
Average	4.28	2.19	2.19	4.72	3.53	5.03	5.72
Rank	4	1	1	5	3	6	7
			Aluminum Alloys				
1st	6	6	8	0	3	2	1
2nd	8	4	8	3	3	1	0
3rd	6	8	1	2	3	5	0
4th	4	4	3	7	3	3	2
5th	2	2	3	6	10	2	1
6th	0	2	1	5	0	12	6
7th	0	0	2	3	4	1	16
Average	2.54	2.92	2.85	4.65	4.15	4.62	6.23
Rank	1	3	2	6	4	5	7

Table 22. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	0	7	7	3	1	5	2
2nd	6	11	0	3	2	2	0
3rd	4	3	8	3	5	0	0
4th	6	3	6	3	4	2	0
5th	3	0	3	10	5	2	1
6th	5	0	0	2	3	8	4
7th	0	0	0	0	4	3	15
Average	3.87	2.08	2.92	3.83	4.46	4.36	6.18
Rank	3	1	2	4	6	5	7
			Cobalt Alloys				
1st	0	9	4	1	0	4	0
2nd	1	3	5	3	4	0	2
3rd	3	4	6	3	3	0	0
4th	10	1	1	2	3	0	0
5th	1	1	2	4	5	2	3
6th	3	0	0	2	3	7	2
7th	0	0	0	3	0	4	10
Average	4.11	2.00	2.56	4.27	4.00	4.90	5.94
Rank	4	1	2	5	3	6	7
			All Data				
1st	8	43	46	8	7	17	5
2nd	20	39	21	13	19	9	5
3rd	26	24	26	16	27	8	5
4th	36	15	19	20	20	7	9
5th	18	6	13	35	32	12	12
6th	20	2	1	20	12	49	22
7th	1	0	3	17	12	24	68
Average	3.78	2.29	2.59	4.47	4.05	4.83	5.83
Rank	3	1	2	5	4	6	7

25 for each class of alloys, and for all the data sets, for the cases of second and third order approximations to appropriate master curves, respectively. Tables 24 and 26 list the frequencies of ranking based on second and third order polynomial approximations, respectively.

Overall Rankings

In Tables 6, 11, 16, 20, and 24 are listed the number of times that each considered correlation procedure gave the best, second best, third best, etc, correlations, in terms of the standard deviation of regression, average deviation of stress, average deviation of rupture-time, square root of adjusted mean square, and square root of the mean square error, respectively, for the cases of second order approximations to appropriate master curves. In Table 27 these values have been averaged over all five of the considered statistical methods. Table 27 also lists equivalent information for third order approximations to appropriate master curves.

Internal Extrapolation

The Concept

Figure 4 represents the Larson-Miller master curve for one of the materials treated in this thesis when all of the data for that particular material was considered for correlation purposes. When extrapolations were to be made, it was then necessary to make arbitrary decisions as to what constituted long-time and short-time rupture-time results. For example, it could have been decided that all rupture-times in excess of 500, 1,000, 10,000, etc, hours constituted long-time data, with the rest then being short-time for the

Table 23. Average Values of Square Root of Mean Square Error (Square Root of Equation 28) for Each Complete Data Set: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	0.189	0.173	0.171	0.196	0.194	0.178	0.190
Rank	4	2	1	7	6	3	5
				Ferritic Steels			
Value	0.213	0.197	0.191	0.222	0.223	0.217	0.269
Rank	3	2	1	5	6	4	7
				Aluminum Alloys			
Value	0.320	0.315	0.262	0.347	0.409	0.451	0.489
Rank	3	2	1	4	5	6	7
				Nickel Alloys			
Value	0.172	0.162	0.156	0.172	0.199	0.168	0.206
Rank	4	2	1	5	6	3	7
				Cobalt Alloys			
Value	0.201	0.183	0.186	0.201	0.205	0.232	0.233
Rank	4	1	2	3	5	6	7
				All Data			
Value	0.220	0.207	0.194	0.229	0.247	0.249	0.281
Rank	3	2	1	4	5	6	7

Table 24. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Square Root of Mean Square Error; Second Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	0	5	11	2	0	10	1
2nd	0	8	6	3	4	0	8
3rd	7	8	5	2	4	1	2
4th	10	2	3	2	3	4	4
5th	3	5	4	6	5	2	4
6th	8	1	0	5	4	5	7
7th	1	0	0	9	9	7	3
Average	4.52	2.89	2.41	5.00	4.97	4.07	4.21
Rank	5	2	1	7	6	3	4
			Ferritic Steels				
1st	1	8	12	0	0	11	3
2nd	4	8	8	1	3	4	1
3rd	6	6	9	2	7	0	4
4th	7	7	1	7	4	3	3
5th	8	3	1	7	6	4	2
6th	5	0	0	11	5	7	5
7th	1	0	1	4	7	3	14
Average	4.13	2.66	2.22	5.16	4.75	3.56	5.22
Rank	4	2	1	6	5	3	7
			Aluminum Alloys				
1st	3	2	11	0	1	8	1
2nd	3	7	5	3	0	4	4
3rd	7	4	4	3	0	3	5
4th	8	6	1	5	3	2	2
5th	3	3	1	5	12	1	0
6th	2	4	1	6	2	7	4
7th	0	0	3	4	8	1	10
Average	3.42	3.50	2.65	4.77	5.42	3.35	4.85
Rank	3	4	1	5	7	2	6

Table 24. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	0	2	9	1	1	11	1
2nd	4	11	5	1	1	0	1
3rd	7	6	3	5	1	1	1
4th	5	3	5	5	2	2	2
5th	2	2	1	9	7	1	2
6th	6	0	1	3	4	5	3
7th	0	0	0	0	8	2	12
Average	3.96	2.67	2.46	4.21	5.38	3.23	5.73
Rank	4	2	1	5	6	3	7
			Cobalt Alloys				
1st	0	9	4	0	0	4	1
2nd	1	4	5	3	2	1	2
3rd	4	1	3	5	4	1	0
4th	7	2	3	0	5	1	0
5th	2	1	3	4	2	3	3
6th	4	1	0	3	3	6	1
7th	0	0	0	3	2	2	10
Average	4.22	2.17	2.78	4.44	4.33	4.33	5.65
Rank	3	1	2	6	4	4	7
			All Data				
1st	4	26	47	3	2	44	7
2nd	12	38	29	11	10	9	16
3rd	31	25	24	17	16	6	12
4th	37	20	13	19	17	12	11
5th	18	14	10	31	32	11	11
6th	25	6	2	28	18	30	20
7th	2	0	4	20	34	15	49
Average	4.06	2.81	2.48	4.77	4.99	3.68	5.06
Rank	4	2	1	5	6	3	7

Table 25. Average Values of Square Root of Mean Square Error (Square Root of Equation 28) for Each Complete Data Set: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	0.172	0.149	0.154	0.177	0.169	0.178	0.190
Rank	4	1	2	5	3	6	7
				Ferritic Steels			
Value	0.187	0.163	0.164	0.196	0.184	0.217	0.269
Rank	4	1	2	5	3	6	7
				Aluminum Alloys			
Value	0.225	0.238	0.211	0.263	0.264	0.451	0.499
Rank	2	3	1	4	5	6	7
				Nickel Alloys			
Value	0.149	0.137	0.142	0.146	0.158	0.168	0.206
Rank	4	1	2	3	5	6	7
				Cobalt Alloys			
Value	0.188	0.171	0.174	0.188	0.188	0.232	0.233
Rank	3	1	2	4	5	6	7
				All Data			
Value	0.184	0.171	0.168	0.195	0.192	0.249	0.281
Rank	3	2	1	5	4	6	7

Table 26. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Square Root of Mean Square Error; Third Order Polynomial.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Austenitic Steels				
1st	2	8	11	3	1	3	1
2nd	1	13	4	4	3	2	2
3rd	9	4	4	2	7	3	1
4th	6	3	7	2	4	1	5
5th	3	1	3	6	8	2	6
6th	8	0	0	4	4	8	5
7th	0	0	0	8	2	10	9
Average	4.07	2.17	2.55	4.66	4.21	5.10	5.21
Rank	3	1	2	5	4	6	7
			Ferritic Steels				
1st	0	13	16	1	2	3	1
2nd	4	8	4	0	7	4	1
3rd	5	5	6	6	9	1	4
4th	10	5	3	5	6	0	1
5th	6	1	2	10	4	5	3
6th	7	0	0	7	2	13	3
7th	0	0	1	3	2	6	19
Average	4.22	2.16	2.22	4.75	3.53	4.97	5.78
Rank	4	1	2	5	3	6	7
			Aluminum Alloys				
1st	6	6	9	0	2	2	1
2nd	8	5	7	3	3	1	0
3rd	5	7	1	2	4	5	1
4th	5	4	3	7	3	3	1
5th	2	1	3	6	11	2	1
6th	0	3	1	4	0	12	6
7th	0	0	2	4	3	1	16
Average	2.58	2.92	2.81	4.69	4.15	4.62	6.19
Rank	1	3	2	6	4	5	7

Table 26. (Contd.)

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Nickel Alloys				
1st	0	7	7	3	1	5	2
2nd	6	11	0	3	2	2	0
3rd	4	3	8	3	5	0	0
4th	6	3	6	3	4	2	0
5th	3	0	3	10	5	2	1
6th	5	0	0	2	3	8	4
7th	0	0	0	0	4	3	15
Average	3.87	2.08	2.92	3.83	4.46	4.36	6.18
Rank	4	1	2	3	6	5	7
			Cobalt Alloys				
1st	0	9	4	1	0	4	0
2nd	1	3	5	3	4	0	2
3rd	3	4	6	3	3	0	0
4th	10	1	1	2	4	0	0
5th	1	1	2	4	4	2	4
6th	3	0	0	2	3	9	1
7th	0	0	0	3	0	3	10
Average	4.11	2.00	2.56	4.23	3.94	4.94	5.88
Rank	4	1	2	5	3	6	7
			All Data				
1st	8	43	47	8	6	17	5
2nd	20	40	20	13	19	9	5
3rd	26	23	25	16	28	9	6
4th	37	16	20	19	21	6	7
5th	15	4	13	36	32	13	15
6th	23	3	1	19	12	30	19
7th	0	0	3	18	11	23	69
Average	3.78	2.28	2.59	4.48	4.04	4.82	5.82
Rank	3	1	2	5	4	6	7

Table 27. Number of Times With Best, 2nd Best, 3rd Best, etc, Correlation: Over All Five Statistical Considerations.

Ranking	L-M	M-H	S-G	M-S	S-D	C	K
			Second Order Polynomial				
1st	30	110	201	20	20	219	67
2nd	68	173	142	53	47	62	93
3rd	140	121	114	91	85	37	55
4th	179	102	83	100	73	59	55
5th	111	79	56	149	151	48	44
6th	109	47	28	139	81	122	94
7th	8	13	21	93	188	75	213
Average	3.98	3.09	2.72	4.70	4.99	3.52	4.69
Rank	4	2	1	6	7	3	5
			Third Order Polynomial				
1st	61	172	197	57	41	99	44
2nd	91	193	102	68	98	51	35
3rd	136	117	125	74	113	49	35
4th	148	89	109	101	111	39	40
5th	88	50	71	158	158	54	53
6th	106	19	19	97	60	212	101
7th	8	1	18	84	59	118	313
Average	3.72	2.55	2.82	4.35	4.04	4.62	5.54
Rank	3	1	2	6	4	5	7

particular data set being worked with: the decision as to the particular time taken to separate the long-time and short-time data was based on the number of data points on each side of the arbitrary division - there had to be enough data points on the short side to allow extrapolation to the longer times. A correlation would be run by the computer for each of the seven different correlation methods, using just the short-time data, and then this correlation was used by the computer to predict values of the long-time data. The predicted values were then compared with the actual long-time values, thus allowing an evaluation of the abilities of the seven methods to extrapolate to longer times.

As stated, the dividing line between short-time and long-time was arbitrary for each data set, and the short-time data was then used to extrapolate to longer times. Although this is indeed an extrapolation in terms of rupture-times, it is not necessarily a real extrapolation in regards to the master curves. Because of the nature of the abscissa of Figure 4, it is possible that the long-time data points could lie between short-time points, thus constituting what has been referred to as "internal extrapolation" [19] - internal in the sense that on the master curves being considered, the long-time points are not beyond the extremes of the short-time points.

Stress Extrapolation

Table 28 lists the percentage deviation of stress, as defined by Equation 23, for each single long-time data point involved with internal extrapolation. Compared are the actual and predicted values

of stress for these long-time data points, as calculated by the computer from known values of temperature and rupture-time. For each data point there are three horizontal columns: the first gives results obtained when the master curve was represented by a first order polynomial, the second gives those results obtained when the master curve was represented by the best second order polynomial, and the third is based on third order polynomial approximations to the master curves. Under the vertical column headed "A" is listed, downward, the actual temperature of the test (^{o}F), the actual stress value utilized in the test (psi), and the experimentally determined value of rupture-time (hours).

It should be noted that it was not possible to make nearly as many extrapolations by the Conrad and Korchynsky methods as were possible by the utilization of the other five correlation methods. The Conrad and Korchynsky methods were not used for extrapolation unless there were at three other data points (short-time) at the same temperature as the point to be extrapolated. Averaged values of the percentage deviation of stress are listed in Tables 29 and 30 for the cases of second and third order polynomial approximations to master curves, respectively. Again, it must be kept in mind that the averages are not over nearly as many values for the Conrad and Korchynsky methods as for heavily used methods. Also, for obvious reasons the averaged values did not include those results marked by asterisks in Table 28.

Rupture-Time Extrapolation

Table 28. Percentage Deviation of Stress (Equation 23): Internal Extrapolation.

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1050.0	-9.60	-13.19	-7.15	-14.48	-12.64		
	30000.0	-7.04	-8.70	-4.43	-10.66	-5.56		
	13629.7	-9.00	-7.94	-4.73	-12.67	-3.84		
1	1050.0	-9.68	-13.67	-6.23	-15.88	-14.33	-2.83	1.34
	27000.0	-6.34	-9.30	-3.46	-10.96	-5.01		
	32505.5	-6.88	-8.59	-3.67	-11.60	-3.28		
2	1050.0	11.36	9.67	12.17	9.25	9.87	3.03	6.85
	24000.0	10.94	7.59	9.97	9.49	11.34		
	7863.4	10.01	6.79	9.07	8.62	24.33		
2	1200.0	-11.09	-8.87	-10.87	-10.52	-15.12	-13.07	-7.79
	15500.0	-11.44	-5.85	-6.66	-10.28	-13.84		
	9752.1	-9.30	-4.16	-5.22	-8.03	-3.82		
3	1050.0	2.48	3.63	5.94	-0.53	-2.38	-3.55	1.46
	24000.0	5.07	2.40	5.46	3.90	4.73		
	11858.3	4.76	2.23	3.85	3.53	4.19		
3	1200.0	-11.54	-5.79	-7.44	-12.09	-16.98	-7.65	-3.65
	16500.0	-9.15	0.40	-5.24	-7.89	-11.08		
	10646.4	-11.63	-0.70	-6.41	-10.59	-16.30		
3	1200.0	-9.90	-3.52	-5.42	-10.54	-16.04	-8.58	-1.25
	15000.0	-7.73	4.50	-2.31	-6.49	-10.47		
	18208.1	-10.62	3.21	-3.47	-9.74	-16.38		
4	1350.0	-16.15	-19.45	-15.32	-18.73	-14.79	-66.68	-31.62
	9000.0	-16.91	-20.80	-15.83	-20.51	-17.39		
	1429.0	-14.21	-16.61	-12.74	-17.64	-13.06		
4	1350.0	-17.82	-22.80	-17.92	-20.79	-16.61	-98.42	-36.77
	8000.0	-17.05	-20.25	-14.07	-21.65	-18.86		
	2127.0	-12.13	-15.57	-10.43	-16.43	-11.17		
4	1350.0	-26.79	-32.51	-27.56	-29.76	-25.80	-128.50	-46.36
	8000.0	-24.61	-26.93	-20.40	-29.54	-27.31		
	2968.0	-18.54	-22.54	-16.83	-23.13	-17.86		
4	1350.0	-7.15	-15.10	-8.50	-11.10	-5.94	-155.38	-33.39
	6000.0	-3.43	-6.08	2.78	-10.16	-7.50		
	3429.0	5.18	-0.45	7.45	-1.09	5.93		
4	1350.0	8.67	-1.03	6.88	3.93	10.06	-176.90	-22.86
	5000.0	13.61	10.70	21.42	5.45	8.48		
	3685.0	24.23	17.30	26.95	16.62	25.02		
4	1500.0	-25.07	-27.20	-29.20	-22.24	-24.92	-57.78	-22.76
	4000.0	-15.77	-9.26	-6.76	-17.40	-22.20		
	2586.0	-6.21	-7.47	-5.19	-6.24	-6.70		
4	1500.0	-29.62	-30.64	-32.51	-26.40	-28.55	-86.84	-26.42
	3500.0	-15.01	-7.41	-3.89	-17.50	-22.94		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
4	4360.0	-3.02	-6.89	-3.26	-5.03	-5.50		
4	1500.0	-28.53	-28.85	-30.74	-24.85	-26.77	-113.62	-24.52
	3000.0	-8.94	0.02	4.53	-12.24	-18.53		
	6310.0	4.44	-1.02	4.07	1.65	0.96		
4	1650.0	-27.79	-12.95	-17.19	-15.07	-17.36	-11.27	-3.90
	2500.0	-4.70	2.28	1.84	-4.37	-9.50		
	1260.0	2.66	3.09	1.90	3.86	1.52		
4	1650.0	-33.92	-19.14	-24.62	-25.16	-26.44	-37.80	-7.46
	2000.0	-4.37	4.72	4.83	-4.63	-11.45		
	3320.0	1.13	-1.81	-0.86	1.93	-4.10		
5	1200.0	1.90	-4.75	1.88	-3.64	-2.01	14.14	20.23
	15000.0	3.18	0.71	4.84	-0.75	4.02		
	23146.4	4.22	2.02	7.23	0.07	5.30		
5	1350.0	5.38	2.98	2.83	4.56	0.03	-0.81	6.46
	7000.0	6.36	1.14	0.22	6.97	4.66		
	13848.2	3.23	-15.03	-16.88	4.41	1.46		
6	1050.0	-11.38	5.34	-5.37	-16.21	-17.65	-0.25	2.63
	31500.0	-4.08	4.64	-3.00	-7.10	-3.52		
	16943.9	-2.83	5.07	-1.01	-6.07	-2.05		
6	1200.0	-7.57	-2.66	2.97	-9.48	-15.27	0.39	7.21
	15500.0	1.32	1.06	1.13	1.53	0.44		
	13506.6	-6.38	-2.69	-9.14	-5.87	-8.59		
7	1050.0	-24.78	-15.08	-11.98	-30.35	-34.64	-16.64	-10.34
	34000.0	-8.52	-12.15	-8.51	-11.05	-9.09		
	11534.2	-6.43	-11.41	-8.83	-8.83	-5.81		
7	1050.0	-26.22	-13,83	-10.72	-32.74	-37.65	-17.69	-8.44
	31500.0	-7.19	-11.05	-6.67	-10.29	-8.13		
	18285.8	-5.26	-10.47	-6.28	-8.32	-4.91		
8	1200.0	-12.37	-0.45	-1.07	-13.30	-19.46	-9.59	-1.17
	15500.0	-4.09	-2.41	-4.13	-1.85	-6.20		
	10286.2	-1.58	-0.09	0.35	1.11	-7.38		
9	1050.0	-10.05	-13.63	-7.72	-14.90	-14.63	8.87	11.58
	35000.0	-8.35	-11.29	-6.25	-12.36	-7.41		
	15181.9	-8.30	-9.33	-3.29	-12.35	-5.82		
9	1200.0	-0.66	0.41	0.99	-2.11	-7.49	13.35	16.32
	16000.0	1.13	-0.80	0.59	0.56	-0.34		
	11624.0	1.10	-3.01	-2.66	2.03	-1.19		
10	1050.0	-1.21	1.26	5.47	-5.28	-7.34	11.18	13.11
	31000.0	5.39	2.67	5.75	3.03	5.06		
	14912.0	8.67	6.59	10.34	6.20	9.31		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
10	1200.0	-4.34	6.97	6.39	-5.16	-11.83	9.95	13.36
	16000.0	2.08	5.22	4.36	3.38	-0.54		
	13698.7	-8.11	-32.30	-30.69	-6.38	-12.91		
11	1200.0	-7.68	-20.81	-4.51	-19.96	-11.53	12.82	20.66
	16000.0	-4.71	-7.42	2.47	-15.06	-1.61		
	13689.0	-6.43	-5.32	5.29	-17.91	-2.46		
11	1400.0	1.89	-2.81	1.78	-1.63	-3.15	-18.32	10.78
	6000.0	1.28	-9.25	-5.65	-1.78	-2.37		
	13696.6	-6.39	-27.67	-21.70	-8.89	-9.71		
12	1200.0	-5.76	-24.23	-11.54	-17.38	-11.80	-19.58	3.78
	12500.0	-11.48	-21.82	-8.67	-19.38	-10.45		
	12501.8	-11.48	-24.29	-9.04	-21.44	-10.39		
12	1400.0	28.71	13.72	15.35	23.98	18.77	-14.84	18.26
	4000.0	24.54	6.79	10.53	22.29	19.76		
	10267.1	24.44	-16.61	-12.78	19.62	19.29		
13	931.0	-5.55	-22.18	-7.51	-18.95	-3.80	16.74	18.44
	49780.0	-5.70	-8.52	4.75	-16.00	-0.34		
	15666.0	-5.56	3.41	13.59	-15.23	-0.62		
13	1021.0	-9.36	-15.61	-8.04	-15.36	-11.89		
	42670.0	-6.45	-8.76	-2.82	-11.45	-4.70		
	2891.4	-5.74	-3.24	1.23	-10.20	-3.29		
13	1111.0	-3.67	-2.01	2.59	-6.97	-10.78	1.63	3.23
	28450.0	4.27	0.92	4.43	1.55	3.91		
	1652.1	5.25	4.69	6.88	3.17	6.26		
13	1111.0	-1.30	0.90	7.39	-6.14	-11.04	2.90	8.91
	24180.0	8.63	3.25	8.69	4.59	7.88		
	3937.5	9.37	4.33	9.23	5.76	9.86		
13	1111.0	-5.25	-2.99	3.75	-10.31	-15.29	-2.03	5.46
	24180.0	4.67	-1.20	4.63	0.40	3.78		
	5088.8	5.28	-1.67	4.19	1.33	5.46		
13	1201.0	-5.44	0.50	2.07	-6.71	-13.28	-0.14	2.94
	19920.0	3.20	1.17	1.74	2.83	2.16		
	1202.5	3.09	-1.55	-1.57	2.82	2.17		
13	1201.0	1.89	8.51	10.66	0.11	-7.53	4.20	11.45
	8530.0	11.01	7.91	8.89	10.32	9.43		
	1930.7	10.52	-0.61	1.31	9.67	8.52		
13	1336.0	19.06	21.38	18.17	20.17	15.37	-12.10	8.65
	8530.0	8.69	-1.48	-6.22	12.04	-0.55		
	1071.0	9.20	-4.07	-7.58	12.03	3.46		
14	1111.0	-6.28	-4.76	-3.37	-8.68	-7.86	-4.73	-3.26
	24640.0	-3.16	-4.74	-2.63	-4.71	-3.15		
	20437.0	-3.70	-5.49	-3.16	-5.43	-3.68		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
14	1111.0	-4.55	-2.16	-0.63	-7.59	-6.69	-4.06	-0.37
	22400.0	-1.28	-3.33	-0.26	-3.43	-1.59		
	43016.0	-2.58	-5.03	-1.34	-5.15	-2.98		
14	1156.0	1.35	5.59	5.04	-0.30	-0.75	3.56	8.48
	19040.0	3.74	3.12	4.66	2.87	3.05		
	20582.0	1.76	0.73	3.10	0.44	0.89		
14	1201.0	7.39	10.90	9.67	6.78	5.88	3.84	8.06
	15680.0	6.80	7.07	7.86	6.63	5.65		
	13953.0	4.83	4.71	6.49	4.22	3.51		
15	1111.0	-10.81	-10.96	-2.86	-24.13	-27.61		
	33600.0	1.15	-5.24	1.06	-3.23	3.67		
	15246.0	0.23	-3.54	1.30	-4.02	1.44		
15	1111.0	-12.73	2.48	9.56	-24.23	-36.60	10.66	12.93
	22400.0	9.85	7.38	10.97	7.51	7.07		
	17896.0	9.87	7.08	10.83	7.37	8.26		
15	1201.0	-13.10	2.17	9.27	-24.63	-37.00	10.28	12.66
	22400.0	9.53	7.06	10.66	7.19	6.73		
	18316.0	9.55	6.74	10.51	7.03	7.90		
15	1201.0	-21.68	-7.70	-1.20	-32.20	-43.46	-0.45	1.92
	24640.0	-1.00	-3.26	0.04	-3.16	-3.59		
	19200.0	-1.02	-3.60	-0.12	-3.32	-2.58		
15	1291.0	-26.59	-3.08	0.75	-34.38	-48.88	4.93	6.04
	17920.0	-1.60	0.16	-0.32	-1.02	-6.72		
	17579.0	-2.06	-2.28	-1.67	-1.25	-6.35		
15	1291.0	-26.28	0.66	5.33	-35.47	-51.36	6.30	12.33
	15680.0	1.91	3.85	3.53	2.45	-4.27		
	34381.0	0.46	-0.06	1.15	1.55	-6.34		
16	1021.0	4.61	-8.63	2.48	-4.04	9.25		
	35840.0	3.51	-2.40	3.89	-3.68	8.41		
	11011.0	3.02	0.71	5.26	-3.68	6.72		
16	1021.0	11.95	-2.06	11.24	1.30	14.46		
	31360.0	12.08	4.59	12.91	3.33	16.90		
	15384.0	12.19	8.66	14.98	3.92	16.25		
16	1111.0	2.52	0.98	9.73	-4.90	-7.76	-5.00	5.88
	20160.0	9.18	3.37	10.89	3.49	7.78		
	18302.0	12.17	7.52	14.01	6.19	13.05		
16	1111.0	13.44	12.36	24.45	3.04	-1.65	-6.32	18.63
	15680.0	22.58	13.86	25.60	14.39	19.45		
	37604.0	25.71	17.01	28.43	17.05	25.36		
16	1201.0	-10.10	-4.55	-2.00	-13.14	-21.51	-12.23	-5.20
	15680.0	-2.78	-4.82	-1.60	-4.14	-6.14		
	10960.0	-1.22	-3.62	-1.06	-2.49	-2.84		
16	1201.0	-2.01	4.34	7.61	-5.83	-15.49	-8.71	3.79
	13440.0	6.26	3.52	7.89	4.40	1.99		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
16	14923.0	7.44	3.59	7.71	5.71	4.76		
16	1201.0	3.11	10.41	14.87	-1.92	-13.16	-16.22	10.15
	11200.0	12.14	8.07	14.70	9.37	6.12		
	27095.0	12.14	4.88	12.65	9.53	6.85		
16	1201.0	8.07	16.62	22.75	1.39	-11.81	-38.43	16.80
	8960.0	17.42	11.13	21.63	13.22	8.26		
	60254.0	15.37	1.74	16.29	11.37	5.16		
16	1291.0	-3.66	7.38	6.16	-5.11	-18.76	-46.40	4.15
	6720.0	0.00	-1.25	3.31	1.13	-10.15		
	37958.0	-5.14	-16.55	-5.96	-3.64	-18.59		
16	1381.0	20.10	30.11	24.07	22.13	10.03	-5.46	25.49
	4480.0	19.00	22.13	20.66	24.00	10.70		
	10269.0	12.73	5.56	10.98	17.60	0.37		
16	1471.0	30.22	31.52	20.53	37.00	30.03	-53.31	28.13
	2240.0	4.73	7.00	10.68	12.41	-25.11		
	16629.0	14.01	8.12	12.47	18.17	4.71		
17	1112.0	-16.10	-24.23	-13.01	-25.00	-18.49	-18.60	-5.88
	22400.0	-12.44	-17.48	-9.55	-19.63	-9.67		
	10430.0	-11.48	-12.72	-7.05	-18.70	-7.65		
17	1112.0	-15.23	-23.63	-8.05	-28.40	-22.90	-49.14	0.47
	15680.0	-9.18	-19.78	-5.12	-20.30	-8.28		
	41836.0	-8.63	-18.52	-3.60	-20.02	-6.75		
17	1202.0	-4.05	-4.74	6.65	-15.50	-18.31	-114.69	5.21
	6720.0	1.33	-13.54	3.45	-8.57	-5.42		
	82557.0	-0.46	-26.42	-1.52	-10.64	-9.13		
17	1292.0	-4.42	-0.32	0.80	-7.62	-13.24	-23.59	12.98
	6720.0	-0.46	-3.51	-0.87	-1.44	-3.74		
	11404.0	-2.18	-11.68	-4.61	-3.34	-7.32		
17	1292.0	14.79	19.76	21.95	9.88	2.63	-58.72	37.99
	4480.0	17.18	9.09	16.67	14.30	9.64		
	25382.0	14.70	-5.46	10.32	11.47	4.55		
17	1382.0	28.97	33.92	29.21	30.11	22.52	-119.64	36.16
	2240.0	16.45	2.61	13.94	15.97	-1.48		
	29069.0	17.86	-1.36	11.09	17.30	5.64		
18	1112.0	-9.16	-4.68	-4.56	-11.99	-11.30	-12.12	-6.49
	42560.0	2.08	-0.39	1.46	1.01	1.47		
	21712.0	-0.18	-1.05	0.51	-0.53	0.07		
18	1202.0	-26.40	-16.81	-20.70	-27.47	-28.95	-17.81	-13.99
	33600.0	-10.57	-13.75	-13.50	-10.13	-12.29		
	28435.0	-8.94	-8.23	-5.51	-8.95	-10.84		
18	1202.0	-17.82	-7.73	-11.90	-18.87	-20.50	-8.43	-5.34
	31360.0	-0.79	-3.83	-3.73	-0.26	-2.50		
	20846.0	0.32	1.12	3.59	0.44	-1.51		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
19	1050.0	-19.36	-10.48	-6.87	-24.61	-29.28	-5.64	-2.91
	56000.0	-4.61	-7.68	-4.25	-6.96	-5.82		
	12833.6	-1.65	-5.15	-3.19	-4.18	-1.10		
19	1150.0	-17.18	4.28	1.07	-20.88	-28.76	4.93	9.12
	38000.0	1.96	3.78	5.10	1.18	-1.48		
	15460.8	2.90	3.00	4.91	2.07	1.00		
19	1200.0	-10.16	15.62	9.71	-13.16	-22.26	12.66	19.28
	29000.0	8.38	13.30	13.07	8.91	3.70		
	17826.5	1.98	7.45	10.73	2.98	-6.49		
20	1200.0	-0.98	-0.85	-0.34	-3.91	-11.01	-8.63	-0.67
	30000.0	-0.97	-3.13	-0.39	-2.11	-3.34		
	11937.0	-1.21	-3.57	-0.75	0.09	-4.54		
20	1200.0	2.55	2.09	3.37	-1.31	-9.41	-14.90	3.76
	25000.0	2.56	-2.10	3.81	0.28	-1.93		
	43979.0	2.22	-2.82	3.32	2.64	-3.73		
20	1350.0	1.08	3.28	0.24	2.12	-4.01	-8.91	1.77
	17500.0	1.08	-1.08	1.49	1.94	-4.11		
	16694.0	0.89	-1.56	1.24	4.21	-4.96		
21	1000.0	-22.01	-12.13	-5.30	-28.53	-39.99	0.52	1.85
	80000.0	-5.12	-10.18	-5.10	-9.61	-6.89		
	4554.0	-1.29	-6.21	-0.79	-5.55	-0.62		
21	1100.0	-28.04	-3.68	1.96	-32.77	-48.90	11.47	14.42
	55000.0	-1.00	-1.97	3.06	-4.58	-6.50		
	5244.0	5.85	2.08	6.88	2.21	4.97		
21	1100.0	-24.08	-4.50	-0.07	-27.66	-42.18	8.31	9.83
	60000.0	-2.04	-2.89	0.84	-4.71	-6.26		
	2550.0	4.02	1.11	4.65	1.30	3.45		
21	1100.0	-22.30	-6.61	-3.11	-24.87	-37.70	4.14	4.87
	65000.0	-4.52	-5.20	-2.37	-6.53	-7.88		
	1501.0	0.75	-1.53	1.18	-1.34	0.30		
21	1100.0	-30.80	-15.29	-11.80	-33.49	-45.67	-4.86	-3.95
	70000.0	-13.26	-13.94	-11.08	-15.30	-16.58		
	1861.0	-8.23	-10.50	-7.78	-10.33	-8.66		
21	1100.0	-23.08	-10.13	-7.25	-24.96	-36.54		
	70000.0	-8.37	-8.91	-6.63	-9.97	-11.18		
	1081.0	-3.74	-5.60	-3.39	-5.44	-4.13		
21	1200.0	-30.95	4.14	7.66	34.15	-52.47	14.49	22.14
	35000.0	1.04	4.51	8.98	-0.87	-7.35		
	7131.0	2.74	2.49	5.72	1.13	-2.54		
21	1200.0	-23.42	4.80	7.29	-25.72	-41.94	24.91	17.67
	40000.0	3.90	6.03	8.63	2.66	-1.63		
	2275.0	7.88	7.26	8.74	6.97	6.21		
21	1300.0	-8.60	29.76	29.40	-10.14	-30.56	27.38	43.53
	20000.0	19.18	27.62	29.59	21.13	9.01		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
21	3538.0	6.48	13.79	14.32	9.18	-9.35		
21	1300.0	-10.82	17.78	17.56	-12.14	-27.71	20.39	27.85
	25000.0	14.71	17.91	18.22	15.21	9.80		
	1435.0	5.74	10.10	9.26	8.04	-2.46		
21	1350.0	-6.16	17.07	15.46	-7.19	-20.82	12.99	16.67
	20000.0	10.81	15.60	14.89	13.50	7.05		
	1232.0	-4.23	2.38	1.62	-1.21	-15.82		
22	1112.0	5.22	-4.24	8.08	-0.90	-0.96	8.11	17.34
	30000.0	6.60	1.57	10.73	-1.81	8.54		
	4258.0	6.76	3.95	12.16	1.06	9.50		
22	1112.0	0.13	-8.22	2.19	-4.77	-3.52	4.06	9.74
	34000.0	0.97	-2.08	4.80	-5.93	3.08		
	2274.0	1.11	0.50	6.19	-3.46	3.85		
22	1140.0	-2.39	-8.08	-0.82	-5.60	-6.29		
	34000.0	-1.40	-3.51	1.09	-6.21	0.00		
	1077.0	-1.26	-1.28	2.32	-4.21	0.82		
22	1160.0	1.47	-3.26	3.34	-1.55	-4.54		
	30000.0	3.05	0.31	4.96	-1.48	3.97		
	1110.0	3.21	2.40	6.14	0.52	4.93		
22	1202.0	11.34	7.83	14.62	7.83	-1.90	11.80	24.53
	20000.0	14.55	8.19	14.85	9.27	13.76		
	3307.0	14.63	7.49	14.45	11.61	14.47		
22	1202.0	2.80	0.40	4.98	0.54	-6.28	6.85	11.76
	25000.0	5.28	1.99	5.93	1.84	5.27		
	1074.0	5.41	3.41	6.64	3.59	6.22		
22	1320.0	0.51	2.97	2.71	0.44	-12.54		
	15000.0	3.65	0.38	1.18	3.16	1.55		
	1505.0	3.46	-4.70	-2.41	3.92	0.57		
22	1425.0	-4.17	0.21	-3.35	-2.03	-14.79	-14.74	
	10000.0	-3.15	-6.21	-8.97	-1.02	-7.56		
	1690.0	-3.54	-19.75	-16.42	-0.88	-10.11		
22	1480.0	-8.62	-4.27	-9.00	-5.13	-16.45	-28.02	-2.86
	8000.0	-9.99	-16.62	-19.63	-6.70	-17.64		
	2237.0	-10.25	-29.92	-26.33	-6.15	-18.98		
22	1540.0	3.53	7.42	1.78	7.94	-0.53		
	6000.0	-0.10	-9.03	-12.35	4.40	-9.86		
	1258.0	-0.15	-17.56	-16.25	5.09	-9.14		
23	1000.0	-37.31	-37.93	-30.29	-43.33	-47.68		
	75000.0	-29.95	-33.83	-28.75	-33.92	-30.78		
	15600.0	-29.32	-32.16	-27.79	-33.37	-28.81		
23	1022.0	-10.75	-10.64	-2.81	-16.71	-22.46	2.10	3.40
	55000.0	-2.21	-5.87	-1.13	-5.96	-3.23		
	3680.0	-1.35	-3.61	0.13	-5.19	-0.72		
23	1112.0	-9.65	-4.60	1.11	-12.70	-22.07	3.00	5.19

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
23	45000.0	1.28	-1.15	1.62	-0.27	-1.07		
	1020.0	2.39	1.13	2.62	0.77	2.36		
23	1112.0	-8.97	-3.60	2.89	-12.53	-22.68	4.72	7.62
	43000.0	2.99	0.19	3.42	1.13	0.38		
	1579.0	4.08	2.38	4.27	2.16	3.93		
23	1112.0	-12.00	-6.04	2.25	-16.74	-28.38	3.33	8.61
	40000.0	1.97	-1.86	2.58	-0.70	-1.36		
	5367.0	2.84	-0.58	2.69	0.14	2.05		
23	1112.0	-11.98	-5.46	4.37	-17.66	-30.57	4.38	12.11
	37000.0	3.57	-1.23	4.35	0.20	-0.51		
	13140.0	4.21	-1.24	3.58	0.83	2.61		
23	1125.0	-8.58	-2.33	4.62	-12.88	-23.48		
	40000.0	4.59	1.62	4.97	2.73	1.61		
	2110.0	5.59	3.54	5.48	3.71	5.15		
23	1140.0	-9.88	-3.27	2.87	-12.91	-23.90		
	40000.0	2.88	0.39	3.11	1.53	0.01		
	1417.0	3.84	2.38	3.60	2.50	3.44		
23	1320.0	1.43	11.97	14.40	0.80	-12.77		
	20000.0	13.07	14.50	11.74	15.66	9.63		
	1212.0	10.12	4.04	2.68	13.76	3.07		
24	1200.0	3.48	-1.77	3.97	-0.86	1.41	16.92	19.98
	16500.0	5.34	4.07	8.91	1.87	6.71		
	12931.0	8.21	10.38	13.75	4.71	9.52		
24	1200.0	82.09	71.81	82.85	73.75	77.74	106.47	114.12
	9000.0	85.66	81.63	91.59	78.94	87.97		
	16730.4	90.21	92.52	99.45	83.40	92.61		
25	1200.0	4.61	2.71	8.41	-0.51	-1.53	22.69	26.72
	16000.0	11.22	8.34	12.50	8.01	11.82		
	14584.7	11.80	10.87	14.82	8.43	12.85		
25	1350.0	8.04	11.99	11.73	6.95	0.06	6.41	13.85
	7000.0	14.13	10.49	8.35	15.22	12.01		
	13913.4	12.40	-4.33	-0.25	14.06	9.57		
26	1022.0	-15.94	-12.80	-6.21	-22.13	-21.55		
	27880.0	-11.41	-10.91	-6.74	-14.76	-14.27		
	18236.0	-14.25	-14.86	-8.35	-18.44	-18.19		
26	1022.0	-7.03	-1.94	7.03	-15.21	-14.94	9.55	16.18
	22190.0	-1.63	0.31	6.39	-6.61	-6.45		
	34610.0	-10.08	-9.42	1.47	-16.69	-17.80		
26	1112.0	-12.43	-2.57	0.61	-15.65	-19.44	4.77	10.36
	17780.0	-8.68	-0.69	0.11	-9.37	-14.12		
	16043.0	-21.21	-15.03	-9.38	-22.53	-27.80		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
27	1022.0	-18.67	-11.59	-8.58	-24.41	-26.14		
	34560.0	-3.92	-7.45	-3.50	-6.76	-3.85		
	11484.0	-2.65	-4.84	-1.49	-5.44	-1.92		
27	1202.0	1.61	13.79	10.29	-0.29	-4.41	-0.47	10.89
	14220.0	3.67	7.32	6.69	4.37	-0.23		
	13510.0	-3.01	-6.49	-3.39	-3.64	-6.99		
28	1112.0	1.73	5.92	6.88	-1.64	-1.12	-1.39	10.07
	17780.0	5.77	5.22	8.15	3.48	4.77		
	10495.0	2.32	1.62	4.94	-0.46	0.98		
28	1112.0	7.56	13.93	14.92	2.99	3.53	-6.63	19.65
	14370.0	7.70	8.92	14.22	3.04	4.42		
	26052.0	2.97	4.36	9.87	-1.85	-0.66		
28	1202.0	4.02	8.18	6.10	3.73	2.29	-14.51	10.95
	11380.0	-13.05	-3.91	-1.89	-17.24	-24.08		
	11941.0	-4.71	0.46	1.70	-5.76	-7.89		
29	1202.0	5.42	2.38	2.31	4.36	3.34	-13.67	2.76
	14220.0	6.45	10.00	11.56	5.02	3.97		
	15607.0	6.44	9.78	11.36	5.00	3.97		
				Ferritic Steels				
1	751.0	-3.09	-8.08	-3.81	-6.27	-1.53		
	28450.0	-3.56	-4.28	-2.72	-6.22	-2.06		
	2204.0	-2.84	-3.87	-2.14	-5.15	-0.18		
1	796.0	-4.44	-5.88	-2.85	-6.60	-5.72	-2.55	-2.99
	24180.0	-2.46	-3.44	-1.85	-4.23	-1.87		
	1762.5	-1.89	-3.05	-1.48	-3.20	-0.06		
1	796.0	-2.71	-4.10	-0.41	-5.37	-4.61	-0.52	-0.39
	22760.0	-0.08	-1.48	0.71	-2.25	0.50		
	2824.0	0.51	-1.08	1.10	-1.21	2.35		
1	814.0	-5.11	-5.33	-2.06	-7.47	-7.84	-2.84	-1.38
	21340.0	-1.80	-3.28	-1.07	-3.68	-1.51		
	3161.0	-1.17	-2.95	-0.62	-2.63	0.31		
1	796.0	-0.85	-2.06	3.38	-4.84	-4.43	1.25	3.88
	19910.0	3.15	0.22	4.56	-0.21	3.52		
	10079.0	3.83	0.55	5.06	0.91	5.44		
1	814.0	-2.29	-2.32	2.49	-5.80	-6.52	-0.82	3.64
	18490.0	1.96	-1.14	3.30	-1.01	1.88		
	10990.0	2.74	-0.94	3.94	0.15	3.80		
1	841.0	-2.18	-1.05	1.49	-4.03	-5.63		
	18490.0	1.60	0.20	2.19	0.23	1.53		
	2969.0	2.38	0.43	2.84	1.39	3.45		
1	886.0	1.09	3.41	4.28	0.36	-2.15	2.49	4.91
	15650.0	4.24	3.66	4.40	4.00	3.87		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
1	1532.0	5.25	3.75	5.36	5.31	5.90		
1	886.0	4.53	7.11	8.88	3.06	-0.02	0.89	9.97
	12800.0	6.04	1.93	7.14	4.98	3.59		
	8657.0	7.15	1.64	8.24	6.34	5.63		
1	931.0	0.87	2.85	2.46	0.84	-1.45	-1.11	2.60
	12800.0	0.68	-0.68	0.91	1.15	-0.96		
	1651.0	1.67	-0.79	1.83	2.44	0.97		
1	931.0	3.66	5.71	5.31	3.56	0.94	-2.51	5.49
	11380.0	1.08	-3.97	1.98	1.38	-3.19		
	4074.0	1.64	-4.00	2.39	2.45	-1.60		
2	931.0	-13.40	1.99	-5.94	-14.87	-19.31	5.47	6.50
	35840.0	6.06	6.33	5.52	6.43	5.77		
	5689.0	4.79	4.44	4.38	5.23	3.90		
2	841.0	-23.29	-6.87	-13.55	-26.34	-31.23	-0.41	0.63
	49280.0	-1.71	-2.36	-1.07	-2.62	-2.74		
	11570.0	-1.24	-1.77	-0.95	-1.99	-1.16		
2	751.0	-14.92	-8.12	-8.37	-18.67	-20.92	-1.15	-0.88
	62720.0	-2.14	-3.93	-1.91	-3.56	-1.88		
	5613.0	-1.86	-2.25	-1.15	-3.19	-1.19		
2	751.0	-18.70	-8.85	-9.85	-23.60	-26.53	-0.10	0.41
	60480.0	-1.47	-3.70	-1.05	-3.32	-1.31		
	13160.0	-1.10	-1.76	-0.18	-2.84	-0.32		
3	751.0	-6.96	-6.43	-5.28	-7.38	-9.31	21.57	-0.64
	29120.0	-5.59	-6.41	-5.40	-5.92	-5.96		
	14654.0	-4.85	-5.54	-4.24	-5.18	-5.05		
3	706.0	-6.76	-6.76	-5.50	-7.36	-8.37		
	38080.0	-5.66	-6.25	-5.39	-6.20	-5.71		
	10082.0	-5.65	-6.00	-6.28	-7.11	-4.99		
3	706.0	-3.63	-3.73	-2.04	-4.46	-5.56	16.33	11.85
	35840.0	-2.31	-3.12	-1.93	-3.06	-2.37		
	13698.0	-2.26	-2.85	-2.78	-3.95	-1.61		
3	706.0	-0.00	-0.22	1.93	-1.09	-2.29	23.20	18.64
	33600.0	1.53	0.43	2.05	0.54	1.44		
	18634.0	1.64	0.77	1.26	0.44	2.24		
3	661.0	4.20	2.72	4.38	3.02	4.85	2.16	34.68
	42560.0	4.11	3.80	4.64	2.98	4.61		
	11727.0	3.57	4.00	3.68	2.42	5.55		
4	796.0	2.24	2.11	3.19	1.44	0.61	3.38	0.24
	24640.0	3.17	-1.44	0.66	2.56	2.06		
	17793.0	2.54	-2.76	-0.44	1.98	1.35		
4	751.0	-4.36	-5.53	-2.61	-6.36	-6.39	-0.08	6.01
	31360.0	-1.14	-3.94	-1.28	-2.66	-1.41		
	23180.0	-1.66	-5.21	-2.14	-3.19	-2.00		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
4	706.0	-4.92	-7.33	-3.33	-7.59	-5.58		
	40320.0	-2.41	-2.69	-0.00	-4.47	-1.71		
	12290.0	-2.06	-1.67	0.73	-4.15	-1.26		
5	931.0	-5.59	-12.51	-6.29	-10.05	-4.17		
	28450.0	-6.24	-11.37	-7.05	-10.33	-4.56		
	1079.3	-5.72	-10.35	-7.35	-9.50	-4.22		
5	931.0	-7.27	-14.35	-6.34	-13.08	-8.44	-0.72	0.95
	25600.0	-6.92	-13.24	-7.04	-12.30	-5.69		
	2924.0	-6.24	-12.27	-7.29	-11.45	-5.11		
5	931.0	-5.01	-12.34	-3.60	-11.34	-6.90	3.03	5.15
	24180.0	-4.42	-11.23	-4.29	-10.32	-3.33		
	3814.0	-3.75	-10.36	-4.61	-9.54	-2.74		
5	976.0	-3.01	-6.22	-0.89	-6.67	-6.78	12.32	15.33
	21340.0	-1.37	-5.39	-1.25	-4.82	-1.19		
	1445.0	-0.69	-4.52	-1.26	-4.00	-0.51		
5	976.0	-1.65	-5.11	1.93	-6.53	-7.71	18.35	23.88
	18490.0	0.48	-4.51	1.75	-4.18	-0.20		
	3973.0	0.40	-4.91	0.81	-4.52	-0.28		
5	1021.0	0.21	0.39	3.67	-1.93	-6.06	18.56	17.30
	17070.0	2.94	0.84	3.72	0.99	2.05		
	1118.7	2.70	0.47	2.76	0.70	1.84		
5	1021.0	-3.28	-3.20	1.01	-6.07	-10.96	16.70	18.52
	15650.0	-0.68	-3.11	1.30	-3.28	-2.61		
	2825.0	-2.07	-5.10	-0.67	-5.11	-4.13		
5	1021.0	-0.68	-0.66	4.27	-3.97	-9.52	20.56	24.90
	14220.0	1.79	-0.87	4.76	-1.31	-1.06		
	4778.0	-0.35	-3.86	2.27	-4.13	-3.49		
5	1066.0	-2.93	-0.18	1.04	-3.67	-10.36	7.47	14.37
	14220.0	-0.13	-0.25	1.53	-0.57	-2.12		
	1048.0	-2.11	-2.82	-0.85	-2.95	-4.27		
5	1111.0	-2.43	2.08	1.33	-1.89	-11.07	-12.21	3.26
	9960.0	-2.29	0.49	2.80	-1.10	-8.68		
	2618.0	-5.89	-4.21	0.77	-5.62	-12.54		
6	1111.0	0.28	18.25	11.69	-1.39	-6.61	19.96	28.26
	15680.0	20.08	25.14	21.55	22.35	17.31		
	11045.0	7.81	7.89	8.32	10.27	-2.84		
7	1112.0	17.54	23.56	26.30	15.17	12.32	45.98	51.25
	17920.0	30.43	25.33	27.16	28.97	29.20		
	5845.0	31.26	26.06	28.23	30.26	30.53		
8	976.0	-17.91	-7.26	-12.62	-20.91	-20.91	-8.51	-3.07
	32930.0	-10.51	-8.80	-7.77	-12.52	-12.11		
	4108.0	-11.17	-9.29	-8.04	-13.52	-12.99		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
8	1067.0	4.19	11.80	6.64	3.52	2.59	-3.43	10.59
	17690.0	-3.35	3.56	1.54	-4.70	-7.55		
	1664.0	-4.15	2.17	0.85	-5.41	-7.14		
9	850.0	-7.72	-2.18	-3.60	-10.34	-10.34	-4.29	0.56
	15000.0	-0.27	-6.51	-4.26	-1.07	-1.08		
	15192.1	1.52	-2.91	-3.33	0.47	0.45		
9	850.0	-6.02	0.78	-0.97	-9.20	-9.21	-4.60	4.16
	13500.0	1.73	-8.63	-4.88	0.41	0.40		
	27224.3	4.99	-2.62	-3.40	3.25	3.24		
10	900.0	-9.49	-12.06	-3.76	-16.00	-17.89	4.21	3.75
	70000.0	-2.61	-7.32	-1.22	-7.50	-2.46		
	9878.0	0.46	-2.29	2.90	-4.09	1.35		
10	1000.0	-18.33	-7.73	-3.24	-20.99	-31.80	12.98	12.92
	49000.0	0.37	-3.20	2.32	-2.71	-2.50		
	5108.0	7.71	3.79	8.39	4.38	7.70		
10	1000.0	-11.69	0.87	6.43	-15.04	-27.63	25.87	26.36
	43000.0	10.36	5.92	12.77	6.53	6.83		
	7390.0	18.69	13.57	19.45	14.50	18.62		
10	1000.0	-4.87	9.80	16.50	-8.96	-23.39	39.37	40.57
	38000.0	20.67	15.27	23.61	16.02	16.40		
	10447.0	29.97	23.35	30.79	24.80	29.77		
10	1100.0	1.19	25.64	27.71	0.24	-19.43	45.87	50.49
	22000.0	29.74	27.87	31.99	29.17	22.67		
	6637.0	24.90	4.38	7.12	26.12	16.23		
11	750.0	-14.99	-6.41	-7.80	-19.61	-21.10	3.12	3.41
	88000.0	0.61	-0.40	0.88	-0.25	0.52		
	2579.3	0.80	0.37	1.39	-0.03	1.02		
11	800.0	-21.14	-7.91	-12.56	-25.12	-28.05	3.47	3.79
	80000.0	-0.57	-0.83	0.24	-1.21	-1.68		
	4340.9	0.46	-0.60	0.32	-0.16	0.20		
11	900.0	-12.02	1.01	-5.63	-13.90	-16.87	12.95	14.14
	60000.0	8.24	8.97	8.64	8.49	7.11		
	1213.3	8.34	8.22	7.28	8.88	7.87		
11	900.0	-7.69	7.44	-0.19	-9.93	-13.35	21.08	22.59
	55000.0	15.86	16.68	16.27	16.16	14.55		
	2055.0	15.45	15.06	13.85	16.12	14.69		
11	900.0	-8.79	8.71	0.02	-11.48	-15.38	24.13	26.17
	52000.0	18.30	19.25	18.74	18.68	16.72		
	5165.5	16.75	15.46	13.84	17.61	15.24		
12	950.0	-8.93	-4.28	-1.21	-11.76	-11.43	-3.19	-0.48
	28000.0	-1.49	-4.09	-0.75	-3.52	-2.17		
	31737.0	-0.98	-3.87	-0.60	-3.35	-1.27		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
12	1050.0	-7.29	5.48	4.70	-7.60	-18.15	-2.50	8.18
	17000.0	1.51	0.86	0.32	2.94	-1.27		
	29275.0	3.78	-0.59	3.78	2.28	1.08		
12	1050.0	6.01	21.76	20.79	5.59	-7.43	8.78	25.18
	14000.0	14.75	13.03	13.07	16.60	9.96		
	46347.0	17.61	10.95	17.69	15.71	12.90		
12	1100.0	0.88	13.33	10.77	1.61	-8.25	6.66	16.56
	14000.0	7.21	8.99	5.19	10.55	4.72		
	10728.6	10.24	6.92	9.89	9.54	7.81		
12	1100.0	7.31	22.12	18.80	8.31	-3.69	8.43	25.60
	12000.0	9.91	10.10	6.74	14.49	2.82		
	21243.8	13.18	7.56	12.34	13.37	6.10		
13	900.0	1.91	-1.30	5.11	-2.33	-1.72	1.13	5.71
	35000.0	4.40	-0.92	5.88	0.00	4.42		
	60376.0	6.58	0.12	5.99	1.07	5.39		
13	1000.0	0.31	1.43	3.63	-0.80	-4.38	-3.31	2.10
	25000.0	2.11	-2.86	-0.27	1.03	0.34		
	28614.9	4.37	-3.25	1.08	0.96	1.69		
13	1000.0	-0.03	1.09	3.30	-1.15	-4.72	-3.79	1.76
	25000.0	1.73	-3.34	-0.70	0.64	-0.09		
	29713.6	3.98	-3.75	0.65	0.56	1.27		
13	1050.0	6.74	8.61	8.57	6.86	3.07		
	20000.0	6.18	0.68	1.30	6.68	3.16		
	17359.8	8.55	-0.34	3.11	6.29	4.67		
13	1050.0	6.00	7.86	7.81	6.12	2.33		
	20000.0	5.30	-0.58	0.17	5.79	2.12		
	18710.8	7.65	-1.60	1.96	5.43	3.60		
13	1050.0	26.16	28.36	28.14	26.33	21.26	7.33	23.17
	15000.0	21.84	0.02	7.81	22.43	13.10		
	63870.0	24.42	1.80	8.33	22.80	13.99		
13	1100.0	21.77	23.30	20.63	23.03	20.26	12.46	13.58
	15000.0	16.52	5.31	5.86	18.65	10.45		
	10302.8	18.96	5.99	5.61	18.89	11.32		
13	1100.0	20.95	22.48	19.76	22.23	19.45	11.15	12.63
	15000.0	15.48	3.21	4.24	17.65	9.09		
	11055.2	17.88	4.31	3.58	17.95	9.84		
14	900.0	-16.27	-5.71	-7.30	-17.53	-24.16	-2.22	-0.77
	35000.0	-3.54	-4.59	-3.02	-4.28	-4.74		
	5102.0	25.83	-4.41	-2.38	-3.37	-3.57		
14	1000.0	-9.18	5.33	0.85	-9.14	-17.94	0.87	7.70
	18000.0	1.53	2.13	1.60	2.99	-1.69		
	7438.0	32.41	-0.84	4.43	5.01	-4.35		
15	900.0	-29.15	-12.08	-9.76	-38.01	-44.17	-11.33	-4.33

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	45000.0	-2.38	-4.90	-1.37	-5.07	-1.68		
	2850.0	-1.63	5.23	-3.17	-4.18	7.54		
15	1000.0	-29.07	-9.42	-12.00	-34.33	-40.96		
	35000.0	-5.64	-6.14	-5.69	-6.01	-6.21		
	1630.0	-4.37	-4.81	-3.10	-4.85	11.74		
15	1100.0	-15.53	3.77	-0.96	-18.92	-25.83	-1.51	6.04
	20000.0	2.33	4.00	1.36	4.07	2.04		
	2250.0	6.92	8.76	10.64	7.47	2.58		
16	1000.0	-6.82	-3.21	-0.69	-11.30	-10.60	2.77	8.17
	40000.0	4.70	2.84	5.75	2.67	4.91		
	1687.0	4.95	4.75	6.96	3.05	5.35		
17	1000.0	-24.70	-20.62	-10.26	-33.19	-33.70	-5.54	-0.56
	60000.0	-6.92	-14.31	-5.19	-12.76	-9.33		
	3121.0	-2.68	-9.26	-1.46	-7.89	-3.24		
17	1100.0	-29.14	-18.31	-12.25	-33.94	-38.58	-5.37	4.70
	40000.0	-9.56	-14.92	-9.39	-12.12	-13.79		
	1922.0	8.93	-18.20	-11.61	-11.01	-12.53		
17	1100.0	-12.48	1.68	10.13	-19.09	-24.97	16.00	33.52
	30000.0	12.10	3.97	12.41	8.15	5.87		
	3819.0	11.43	-5.51	6.99	7.79	5.19		
17	1200.0	19.18	35.76	38.03	15.89	7.79	11.29	55.16
	15000.0	27.89	22.58	25.23	29.72	16.28		
	1203.0	15.33	-11.60	2.33	15.26	0.58		
18	1000.0	-24.80	-12.29	-13.62	-27.52	-32.32	5.13	5.92
	50000.0	-4.50	-6.32	-2.98	-6.75	-6.18		
	7192.0	0.70	1.83	4.67	-1.70	2.18		
19	1000.0	-15.60	-9.05	-12.50	-17.36	-17.27	3.69	4.02
	75000.0	-0.81	-1.80	-0.98	-1.39	-0.96		
	1332.0	-0.36	-1.18	-0.12	-1.02	-0.60		
19	1000.0	-14.94	-6.67	-11.09	-17.08	-17.01	8.95	9.51
	70000.0	3.18	1.77	2.84	2.42	2.93		
	2326.0	3.65	1.50	3.60	2.81	3.33		
19	1050.0	-6.53	1.66	-3.62	-7.63	-8.11	11.89	12.81
	55000.0	10.65	9.52	9.67	10.48	10.24		
	1652.0	10.97	1.96	8.00	10.56	10.19		
20	1200.0	-0.63	0.93	7.37	-9.52	-12.38	-26.62	0.23
	4000.0	5.23	1.59	5.58	2.17	3.78		
	1173.0	7.38	1.99	5.57	4.44	3.66		
20	1400.0	-25.29	-13.67	-18.90	-26.30	-36.00	-43.95	-11.41
	1650.0	-22.29	-10.20	-3.53	-18.84	-28.18		
	1316.0	-18.93	-1.55	1.46	-15.42	-31.35		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
21	1090.0	6.34	18.38	24.33	6.70	-11.24		
	10000.0	17.55	17.34	21.14	19.00	5.12		
	2639.0	9.55	-0.12	7.27	13.20	-5.49		
21	932.0	-20.66	-16.63	-5.88	-24.10	-34.05	-0.08	7.08
	35000.0	-4.98	-9.97	-3.07	-9.71	-8.16		
	1902.0	-2.30	-6.36	-0.47	-8.00	-1.76		
21	932.0	-25.46	-20.87	-6.57	-30.34	-41.81	-6.24	10.75
	30000.0	-7.04	-14.36	-3.81	-13.82	-11.96		
	7592.0	-5.37	-13.17	-2.83	-13.05	-6.52		
21	932.0	-22.30	-17.26	-1.01	-27.87	-40.45	-3.28	18.77
	27000.0	-2.16	-10.72	1.78	-10.02	-8.10		
	11410.0	-0.85	-10.70	2.06	-9.60	-2.99		
21	780.0	1.77	-12.59	4.60	-5.31	6.94		
	70000.0	-1.99	-6.89	-2.27	-7.97	1.26		
	1122.0	-2.20	-4.51	-0.25	-8.18	-0.06		
21	900.0	-20.40	-18.79	-7.01	-25.05	-33.32		10.34
	40000.0	-6.09	-12.00	-4.03	-11.87	-8.88		
	2572.0	-2.87	-7.79	-0.51	-9.87	-2.05		
21	1030.0	-12.85	-3.66	4.33	-13.86	-27.18		6.33
	20000.0	5.26	2.93	6.33	3.34	1.80		
	1084.0	2.62	0.65	2.25	1.98	-0.14		
22	900.0	-30.01	-11.29	-19.87	-34.97	-36.45	-7.88	-5.95
	55000.0	-4.61	-5.37	-3.98	-5.71	-5.96		
	1917.8	0.64	-4.51	-3.26	-5.18	-5.19		
22	1000.0	-28.67	-7.65	-20.66	-31.12	-33.44	-8.78	-6.47
	40000.0	-3.95	-3.02	-3.93	-3.59	-5.94		
	1451.1	1.33	-0.53	-0.90	-3.29	-6.17		
23	1000.0	-16.66	-12.07	-10.47	-20.35	-20.90	-18.73	-8.27
	14000.0	-11.68	-12.56	-9.99	-13.69	-12.53		
	22241.5	-12.61	-13.55	-10.81	-14.68	-13.66		
23	1100.0	-7.16	1.09	-1.78	-8.17	-11.15	-12.49	0.52
	7500.0	-6.39	1.23	-1.88	-6.33	-9.35		
	23168.7	-9.44	-1.55	-4.40	-9.53	-13.06		
25	1000.0	4.36	0.55	5.11	1.09	2.54	-3.57	3.44
	11000.0	3.84	2.22	4.42	1.80	4.20		
	13804.7	3.83	2.22	4.52	14.35	4.15		
25	1100.0	3.83	2.20	3.09	3.08	0.61	-1.92	2.38
	67000.0	3.41	2.57	3.84	3.66	1.93		
	11554.5	3.32	1.84	3.45	16.48	1.27		
26	1000.0	-5.38	-10.91	-5.85	-9.23	-6.20	-20.87	2.21
	10000.0	-6.99	-8.28	-4.11	-10.09	-6.36		
	19841.6	-10.01	-10.08	-5.36	-13.10	-8.74		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
26	1100.0	5.75	4.14	3.97	5.68	4.98	-4.11	5.56
	5400.0	6.23	0.80	2.15	5.80	4.99		
	14547.6	2.41	-5.23	-3.05	1.96	1.62		
28	1022.0	7.33	-14.86	-75.93	6.15	6.14	-103.96	-18.65
	17350.0	9.18	166.97	145.18	7.57	7.55		
	15800.0	8.90	-64.20	-66.09	5.35	5.34		
29	1022.0	-13.55	2.92	-6.84	-17.05	-17.06	-1.09	14.55
	11090.0	-8.96	5.26	-2.66	-12.68	-12.70		
	11368.0	-17.21	0.47	-10.01	-20.72	-20.72		
30	1022.0	-11.43	-2.98	-7.69	-13.52	-13.53	-6.65	11.24
	11090.0	-22.86	-4.87	-14.13	-29.25	-29.26		
	23515.0	-11.82	-2.44	-8.13	-13.67	-13.68		
31	932.0	-1.28	9.33	4.71	-4.67	-4.68	21.13	26.55
	27590.0	16.62	15.40	15.61	14.77	14.76		
	14829.0	17.64	2.54	3.68	16.13	16.11		
31	932.0	12.99	26.41	20.55	8.73	8.71	39.64	48.48
	22760.0	34.23	32.56	32.84	31.69	31.67		
	22795.0	33.96	7.72	9.78	31.45	31.42		
32	932.0	-5.60	0.56	-2.09	-7.65	-7.66	9.86	12.09
	43670.0	2.76	2.50	2.53	1.84	1.83		
	20943.0	1.68	-2.88	-2.96	0.49	0.49		
				Aluminum Steels				
1	94.0	-27.36	-9.94	-0.23	-37.10	-45.24	0.21	0.29
	63000.0	-5.29	-6.55	0.38	-8.39	-12.52		
	553.3	-1.89	-4.09	0.78	-3.93	-2.23		
1	94.0	-30.46	-10.29	0.78	-41.33	-49.97	1.23	1.34
	62000.0	-5.36	-6.56	1.44	-9.07	-14.09		
	1044.5	-1.25	-3.81	1.90	-3.64	-1.74		
1	211.0	-35.69	-4.90	1.93	-41.51	-51.12	6.13	6.45
	48000.0	-5.72	-1.47	1.77	-8.04	-19.42		
	867.2	2.12	0.84	2.22	0.86	-0.00		
1	300.0	-18.29	13.19	13.45	-21.64	-30.92	19.03	20.04
	30000.0	13.87	18.04	15.13	13.15	-4.61		
	651.8	12.43	15.43	10.11	15.18	-20.15		
1	300.0	-16.52	18.46	18.84	-20.12	-30.42	24.97	26.47
	28000.0	18.19	23.51	20.25	17.46	-7.17		
	942.5	14.71	18.83	14.12	18.09	-20.26		
2	300.0	-12.82	-13.76	-4.44	-19.13	-21.23	0.27	0.98

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
2	38000.0	-5.37	-2.92	0.90	-8.89	-3.29		
	1168.0	-5.66	-1.64	0.21	-8.79	-2.62		
2	300.0	-4.65	-5.77	4.21	-11.38	-13.59	9.31	10.02
	35000.0	3.24	5.90	9.96	-0.52	5.48		
	1092.0	2.87	7.29	9.20	-0.48	6.18		
2	300.0	-8.92	-7.77	7.67	-19.73	-24.20	13.29	16.66
	30000.0	4.97	7.79	15.21	-1.21	8.09		
	6937.0	6.72	8.69	15.02	2.17	10.03		
3	211.0	-9.84	1.11	-0.73	-13.93	-12.88	2.30	2.31
	54000.0	-1.83	1.87	0.22	-3.54	-2.41		
	570.3	-0.07	-1.04	1.31	-1.17	0.10		
3	211.0	-7.39	4.74	2.75	-11.82	-10.77	6.05	6.07
	52000.0	1.49	5.59	3.75	-0.38	0.80		
	668.1	3.45	2.32	4.93	2.25	3.62		
3	300.0	-9.19	6.81	9.08	-11.29	-13.60	17.36	17.33
	38000.0	8.88	11.36	10.32	7.97	6.46		
	657.6	12.59	10.39	9.98	12.64	12.39		
4	94.0	-12.69	-7.95	-0.97	-18.23	-21.90	-0.03	-0.06
	64000.0	-2.38	-4.75	-0.16	-4.08	-3.80		
	544.6	-1.94	-3.17	0.10	-3.48	-1.43		
4	211.0	-21.51	-5.19	-2.80	-24.58	-32.08	1.59	1.56
	54000.0	-3.50	-3.24	-0.86	-4.57	-9.20		
	582.7	-1.20	-2.00	-0.49	-2.12	-1.39		
4	300.0	-13.03	3.92	3.61	-14.65	-21.49	7.08	7.23
	40000.0	7.31	7.42	6.66	7.08	0.45		
	508.4	5.95	6.45	4.07	6.62	2.34		
4	300.0	-11.93	6.85	6.83	-13.73	-21.40	10.82	11.20
	38000.0	10.54	10.65	9.92	10.26	1.83		
	864.8	8.29	8.48	6.42	9.04	-0.50		
5	200.0	-7.15	-5.68	4.44	-14.50	-14.20	1.41	3.51
	24500.0	1.53	-1.92	5.47	-2.01	1.47		
	1443.7	4.59	0.14	3.55	-1.50	2.48		
5	300.0	-9.44	4.91	1.42	-12.73	-19.44	-1.21	4.91
	13000.0	3.86	3.99	-0.25	5.16	1.57		
	1376.0	7.25	-4.24	7.04	5.28	-0.63		
6	300.0	-9.83	3.31	-7.73	-11.96	-18.41	-5.16	1.86
	13500.0	-2.66	-0.20	-7.47	0.61	-4.99		
	1268.0	-0.05	-13.00	4.86	3.01	-7.82		
7	200.0	2.67	6.15	9.97	-3.18	-4.06	7.05	9.52
	20000.0	8.38	6.62	10.11	6.73	7.56		
	1475.5	8.36	6.02	9.27	6.75	7.77		
7	300.0	-10.40	3.21	-9.29	-11.86	-18.42	-7.03	-0.17

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
7	13000.0	-3.95	-0.52	-9.54	-0.18	-6.46		
	1111.9	-5.22	-10.66	-6.90	-2.29	-12.01		
8	212.0	-30.96	-3.46	-0.97	-35.14	-51.48	0.05	0.16
	36000.0	-1.61	-1.14	-1.25	-2.30	-6.37		
	1098.7	-0.27	-0.84	-0.93	-0.78	-0.66		
9	211.0	-37.26	-17.29	-11.27	-40.11	-49.40	3.21	3.73
	52000.0	-15.99	-12.86	-6.01	-17.59	-25.90		
	759.5	-3.11	-5.93	-2.39	-5.52	-6.83		
9	211.0	-38.25	-17.55	-10.90	-40.37	-50.80	4.34	4.96
	51000.0	-16.09	-12.91	-5.43	-17.91	-26.66		
	991.8	-2.58	-5.68	-1.73	-5.26	-6.36		
9	300.0	-8.01	20.73	23.25	-9.57	-21.57	44.73	49.63
	20000.0	14.93	25.04	27.76	16.47	-17.64		
	1451.6	6.47	4.04	12.68	11.22	-17.51		
10	482.0	-3.62	-1.62	-5.29	-5.02	-11.26	-6.20	2.70
	2840.0	-3.40	-4.11	-4.93	-2.72	-6.04		
	540.0	-4.91	-11.84	-4.86	-5.06	-8.79		
10	572.0	2.24	3.73	-4.35	5.40	2.85	-21.66	-5.56
	1780.0	-3.32	-9.58	-4.10	-2.05	-12.97		
	722.0	-2.81	-13.20	-3.19	-1.92	-10.10		
11	212.0	-6.94	-16.48	1.86	-16.96	-12.56	-4.23	-1.68
	20000.0	-4.78	-10.97	0.86	-12.86	-2.48		
	1560.0	-1.75	-3.57	2.34	-8.81	1.32		
11	212.0	-11.51	-24.62	3.97	-26.76	-24.70	-11.33	-0.81
	17000.0	-7.57	-18.47	2.71	-19.99	-6.50		
	11010.0	-4.03	-9.95	4.05	-15.69	-0.72		
11	300.0	-11.70	-15.14	-3.87	-19.31	-30.26	-5.60	45.88
	11000.0	-6.19	-11.20	-4.24	-10.85	-9.88		
	3800.0	-5.11	-6.56	-6.09	-8.22	-5.66		
11	400.0	9.24	11.44	8.29	5.62	-13.81	-16.60	341.30
	4000.0	11.40	7.99	11.88	11.64	-1.97		
	12850.0	2.75	-14.80	6.71	2.24	-12.90		
11	500.0	3.30	8.17	-7.71	7.08	-2.71		
	3000.0	-1.21	2.14	-3.93	4.74	-12.40		
	1812.0	-3.00	-10.70	-2.67	-0.13	-12.28		
12	400.0	21.16	31.46	17.17	23.03	-17.69	-65.73	6.17
	6000.0	24.58	26.58	11.58	29.35	12.43		
	1150.0	9.43	-0.39	-9.20	14.44	-11.44		
13	212.0	-13.41	-9.36	0.06	-20.86	-25.62		
	5600.0	-1.52	-6.86	-0.83	-4.61	-2.29		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
13	1530.0	-0.75	-5.18	-3.70	-3.62	0.71		
13	302.0	-19.56	-8.31	-4.69	-24.27	-32.33		
	4480.0	-4.65	-6.26	-4.01	-5.85	-7.89		
	2086.0	-4.40	-5.80	-4.74	-5.30	-4.57		
13	392.0	-12.19	0.43	-1.26	-14.66	-23.54		
	2910.0	-1.89	0.45	1.39	-0.66	-8.64		
	5186.0	-5.64	-2.01	4.80	-5.00	-13.19		
13	392.0	-8.03	5.77	3.99	-10.79	-20.60	7.51	9.56
	2690.0	2.10	5.38	7.14	3.30	-8.13		
	8372.0	-1.62	2.40	11.21	-1.21	-9.59		
14	212.0	-22.68	-16.94	-7.97	-27.64	-35.44		
	21500.0	-11.09	-14.54	-6.93	-14.27	-13.73		
	1031.0	-5.91	-9.28	-3.47	-8.70	-6.27		
14	212.0	-32.84	-21.99	-9.11	-40.27	-50.24	3.58	3.66
	20380.0	-15.30	-19.33	-7.38	-20.62	-20.60		
	7168.0	-6.76	-11.99	-2.17	-11.57	-7.95		
14	302.0	-28.87	-10.19	-4.44	-32.13	-43.80	19.74	19.59
	14780.0	-9.34	-8.32	-1.16	-11.88	-16.48		
	1990.0	1.84	-1.11	5.36	-1.40	-0.89		
14	302.0	-30.78	-8.74	-1.29	-34.86	-48.07	28.89	28.97
	13440.0	-8.71	-7.10	2.33	-12.19	-18.72		
	5833.0	3.17	-0.70	8.53	-1.55	-1.61		
14	392.0	-17.85	4.71	4.40	-18.65	-32.12	20.43	22.55
	7840.0	-13.10	2.02	4.30	-10.35	8.82		
	4290.0	-12.42	-5.76	0.46	-12.03	-21.10		
14	392.0	-19.13	5.53	5.26	-19.88	-34.85	23.18	27.25
	7260.0	-15.97	0.60	3.95	-28.38	34.14		
	8902.0	-11.80	-5.47	2.83	-12.00	-19.84		
15	212.0	-12.24	-7.69	2.08	-20.50	-26.82	0.41	1.43
	21500.0	-0.26	-3.99	2.55	-3.66	-1.08		
	2600.0	0.65	-1.78	2.76	-2.50	1.15		
15	302.0	-19.21	-2.62	1.71	-24.50	-36.68	2.28	6.20
	14560.0	-0.47	-0.16	-0.04	-1.01	-4.46		
	3348.0	-2.79	-3.79	-1.93	-2.43	-6.16		
15	302.0	-20.02	-1.31	3.87	-26.40	-39.75	2.79	9.14
	13440.0	0.60	0.80	1.67	-0.26	-4.42		
	7942.0	-4.02	-6.93	-0.98	-4.05	-10.35		
15	392.0	7.87	25.67	18.99	5.28	-7.31	11.03	18.51
	7840.0	20.74	25.73	16.21	25.34	17.45		
	1202.0	6.38	3.58	11.59	10.77	-5.57		
15	392.0	4.77	26.40	16.60	1.46	-14.58	-0.68	18.69
	6720.0	8.99	19.31	11.24	16.14	11.01		
	5790.0	-1.11	-5.99	7.77	2.23	-11.94		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
16	212.0	-29.72	-13.29	-3.57	-37.99	-55.93	-3.37	-2.66
	36960.0	-4.83	-9.54	-3.46	-7.56	-6.91		
	1173.0	-4.26	-19.56	-1.83	-7.21	-3.93		
16	212.0	-33.32	-13.56	-2.28	-42.78	-61.70	-2.21	-1.16
	35620.0	-4.11	-9.39	-2.13	-7.40	-6.89		
	2563.0	-3.42	-22.21	-0.40	-6.95	-3.17		
16	212.0	-37.19	-13.09	0.42	-48.05	-67.88	0.20	1.83
	33600.0	-2.28	-8.39	0.61	-6.40	-6.10		
	7202.0	-1.51	-26.14	2.42	-5.94	-1.42		
16	302.0	-31.10	4.12	9.40	-36.94	-57.63	19.60	22.10
	22400.0	7.10	7.32	10.04	5.86	0.30		
	1726.0	8.67	8.77	8.91	7.62	7.30		
16	302.0	-30.12	10.69	17.23	-36.95	-59.86	27.93	31.58
	20160.0	14.54	14.42	17.91	12.98	6.38		
	3486.0	15.08	12.84	15.53	13.82	13.09		
16	392.0	-23.14	12.87	10.37	-25.84	-44.43		
	13440.0	12.64	14.85	10.74	14.52	7.60		
	1030.0	-0.75	-10.05	-1.84	4.86	-9.39		
16	392.0	-16.91	27.77	24.71	-20.11	-43.35	9.26	13.95
	11200.0	26.51	29.68	24.95	29.20	18.58		
	2114.0	7.75	-19.27	8.80	14.40	-5.19		
16	392.0	-7.36	49.80	45.91	-11.29	-40.79	24.29	33.96
	8960.0	46.15	51.23	45.95	50.09	32.49		
	4653.0	20.77	-17.41	25.05	28.22	4.08		
17	90.0	-25.36	-6.04	-0.53	-32.21	-49.45	-0.16	-0.18
	18870.0	-2.98	-3.91	-0.33	-4.31	-9.32		
	802.5	-1.50	-2.95	-0.12	-2.84	-1.89		
17	300.0	-40.06	-2.35	-0.21	-39.92	-58.46	2.40	2.87
	11500.0	-1.38	2.06	0.98	-1.09	-16.50		
	946.5	-1.99	0.05	-2.53	-0.71	-21.09		
18	90.0	49.58	3.05	28.86	36.73	118.16		
	39500.0	22.92	30.71	32.45	14.14	42.15		
	626.0	9.45	60.69	18.04	4.04	20.40		
18	212.0	-6.38	-7.57	1.02	-11.33	-11.11	1.77	2.21
	26500.0	-1.60	-3.25	1.90	-4.77	-0.81		
	637.6	0.05	-0.36	3.17	-3.13	0.93		
18	300.0	-2.12	7.80	8.85	-5.24	-12.37	8.93	13.92
	13000.0	9.08	8.80	8.49	8.66	8.80		
	874.6	2.04	-2.42	2.43	2.02	0.58		
19	211.0	-44.10	-36.18	-22.54	-45.47	-69.43	6.70	5.09
	52000.0	-31.47	-35.50	-23.98	-36.18	-41.43		
	759.5	-12.53	-16.07	-3.84	-16.76	-20.11		
19	211.0	-45.58	-37.40	-22.77	-47.23	-71.56	7.95	6.39
	51000.0	-32.42	-36.80	-24.29	-37.23	-43.04		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
19	991.8	-12.55	-16.49	-3.25	-17.21	-20.63		
19	300.0	-26.75	-6.80	8.09	-26.31	-63.95	62.74	66.11
	20000.0	-4.89	-7.46	3.29	-9.29	-24.94		
	1451.6	15.32	12.73	16.02	12.08	-3.07		
20	150.0	-14.47	-11.35	-0.72	-21.91	-23.75		
	8960.0	-2.77	-6.10	0.96	-5.88	-5.08		
	9000.0	1.59	-5.55	-0.84	6.47	-2.54		
20	300.0	-17.06	-7.76	-6.52	-19.40	-24.72	-1.99	-0.72
	6160.0	-2.96	-3.47	-4.78	-2.97	-7.92		
	4220.0	1.39	-3.08	-0.61	9.74	-6.70		
20	300.0	-13.59	-2.99	-1.21	-16.48	-22.42	3.66	5.77
	5600.0	2.00	1.08	0.23	1.75	-4.70		
	11380.0	6.59	1.43	7.36	15.07	-3.76		
21	150.0	-12.50	-8.97	2.18	-19.77	-21.79	-0.71	0.01
	13440.0	-3.16	-7.02	2.21	-7.19	-5.20		
	7200.0	-1.70	-5.38	0.74	-5.74	-1.25		
21	300.0	-8.63	3.44	5.05	-11.30	-17.71	4.12	7.40
	7840.0	1.45	1.68	3.38	1.02	-4.34		
	6500.0	-0.27	-2.58	6.54	-0.36	-9.00		
22	150.0	-13.76	-16.22	1.26	-22.60	-32.18		
	22400.0	-5.84	-12.87	2.46	-13.14	-5.97		
	3500.0	-2.85	-3.08	4.40	-8.63	-0.72		
22	300.0	-14.03	-5.99	2.57	-18.15	-36.64	2.62	6.58
	11200.0	-1.66	-6.00	0.12	-5.32	-5.31		
	3890.0	-1.70	-4.99	-3.25	-4.50	-2.31		
22	300.0	-11.01	-2.00	8.18	-16.04	-37.02	7.13	13.31
	10080.0	2.51	-3.18	4.90	-2.13	-2.73		
	7850.0	2.00	-8.65	-0.33	-1.71	-0.13		
22	400.0	3.33	8.34	3.02	2.50	-10.84	-9.48	0.55
	6720.0	3.46	3.60	-0.49	4.95	-7.22		
	1230.0	2.92	-8.32	-6.52	3.86	-2.59		
23	150.0	-11.44	-10.71	6.17	-20.22	-31.52	3.09	3.93
	26880.0	0.02	-6.34	6.72	-6.46	-1.04		
	3800.0	1.68	-0.32	7.07	-4.68	4.10		
23	300.0	-20.43	-8.78	0.55	-23.04	-41.14	1.35	3.06
	15680.0	-2.78	-5.64	-0.95	-5.41	-6.84		
	1796.0	-1.40	-1.48	-0.87	-4.10	0.19		
23	300.0	-22.72	-8.32	5.25	-26.86	-48.75	4.54	9.46
	13440.0	-0.51	-5.39	3.07	-4.97	-6.92		
	8600.0	0.56	-2.57	2.94	-3.91	1.29		
23	300.0	-22.68	-6.78	9.10	-27.57	-51.30	7.00	14.24
	12320.0	1.64	-4.47	6.38	-3.86	-6.69		
	18000.0	2.54	-3.50	6.14	-2.93	2.10		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
23	400.0	-10.93	2.58	3.51	-11.23	-31.22	4.11	10.53
	7840.0	0.07	-0.07	-0.12	0.87	-19.04		
	3900.0	-0.52	-8.84	-0.48	0.41	-8.29		
23	400.0	-14.82	2.11	2.75	-14.90	-39.38	-3.82	12.84
	6720.0	-8.52	-10.14	-4.55	-6.80	35.84		
	17480.0	-4.27	-14.59	-3.58	-3.83	-13.64		
24	90.0	-6.01	-2.70	1.46	-11.66	-19.22	0.44	0.61
	16500.0	0.81	0.03	1.08	-0.24	0.50		
	887.7	0.47	-0.60	1.25	0.03	0.78		
24	300.0	-9.67	-0.65	-9.79	-11.32	-20.12		
	11000.0	-1.28	2.03	2.33	1.33	-0.79		
	520.1	2.33	4.84	3.74	4.25	-2.62		
25	90.0	-6.63	-4.21	0.38	-9.89	-12.97		
	39000.0	-1.17	-2.79	-0.13	-2.64	-3.42		
	633.6	-0.85	-1.43	1.09	-2.23	-0.41		
25	212.0	-27.33	-9.28	-8.24	-27.99	-40.28		
	31500.0	-9.14	-8.16	-6.60	-10.30	-20.81		
	670.7	-6.58	-8.27	-4.87	-7.63	-5.76		
25	300.0	-22.94	-1.42	-3.08	-22.08	-34.15	14.32	14.22
	22000.0	-1.57	0.04	3.19	-2.10	-17.91		
	566.3	-1.66	-1.69	-4.83	-1.11	-1.05		
26	90.0	8.64	-2.08	4.78	3.92	21.96		
	31500.0	2.84	8.50	9.41	0.32	8.79		
	704.0	17.81	9.55	15.17	-66.30	11.23		
26	212.0	-6.36	-6.65	-1.99	-9.00	-9.00	0.47	0.51
	27000.0	-2.57	-3.40	-0.96	-3.78	-2.33		
	898.9	-3.07	-3.40	-1.45	-4.38	-2.06		
26	300.0	-7.48	-5.02	-2.86	-8.65	-11.04	0.67	0.74
	22500.0	-1.84	-2.37	-2.09	-1.93	-2.19		
	523.8	-1.34	-1.96	-1.34	-1.51	-1.83		
				Nickel Alloys				
1	1400.0	-5.51	-3.61	0.96	-10.01	-11.55	-3.73	0.46
	61000.0	1.93	-2.11	0.89	-0.98	1.84		
	2279.8	3.69	-0.23	2.03	1.02	4.40		
1	1400.0	-3.82	-0.04	5.69	-9.55	-11.96	-1.67	5.34
	55000.0	6.10	1.54	5.60	2.37	5.58		
	4063.2	8.03	3.38	6.67	4.55	8.58		
1	1500.0	-6.17	3.76	6.06	-8.37	-13.96	5.41	9.44
	45000.0	4.43	4.53	5.93	3.58	2.73		
	1228.3	6.11	5.67	6.42	5.67	5.60		
1	1500.0	-1.37	10.95	14.10	-4.47	-11.19	10.25	17.97

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
1	39000.0	11.59	11.67	13.95	10.25	9.32		
	2227.4	12.51	12.01	13.77	11.61	11.37		
1	1500.0	11.56	27.97	32.50	7.05	-1.62	22.36	37.33
	31000.0	28.22	28.48	32.33	26.05	24.81		
	4393.4	27.73	27.37	31.08	25.99	25.20		
1	1600.0	-0.03	16.56	17.35	-1.71	-10.18	7.61	20.90
	24500.0	11.44	15.61	17.25	12.03	7.83		
	2899.7	5.42	10.14	13.19	6.26	0.01		
1	1600.0	13.36	34.52	35.70	10.96	0.06	12.28	40.25
	19000.0	25.24	32.13	35.63	25.68	18.80		
	6331.0	16.86	23.98	30.21	17.22	8.14		
1	1700.0	1.15	9.58	7.44	1.20	-4.41	-8.04	4.84
	17500.0	0.63	7.09	7.56	2.82	-3.86		
	1768.7	-3.63	1.97	4.78	-2.29	-8.39		
1	1700.0	12.50	22.62	19.83	12.68	5.59	-4.91	17.18
	14500.0	8.55	18.58	20.03	11.20	-0.02		
	2838.7	6.54	13.60	17.76	8.03	0.84		
2	1200.0	-16.90	-10.28	-3.25	-24.17	-30.83	3.45	6.77
	95000.0	-1.29	-5.92	-0.79	-5.50	-1.71		
	3900.0	0.45	-1.71	2.44	-3.48	1.55		
2	1200.0	-17.91	-8.80	-0.10	-26.69	-34.86	7.34	12.66
	86000.0	1.80	-3.85	2.79	-3.55	0.83		
	7589.9	3.72	0.34	6.03	-1.35	4.79		
2	1300.0	-20.66	-5.05	0.06	-25.65	-36.89	7.60	13.09
	65000.0	0.83	-1.15	2.47	-1.70	-1.93		
	3879.8	2.01	-0.39	2.11	-0.09	1.57		
2	1300.0	-20.73	-2.88	3.27	-26.62	-39.05	10.38	18.78
	59000.0	3.59	1.14	5.74	0.41	0.19		
	6720.4	3.29	0.11	3.74	1.18	2.91		
2	1400.0	-16.92	-1.49	-0.02	-18.78	-28.88	3.82	6.52
	52000.0	0.87	1.53	1.81	0.92	-1.27		
	1092.4	-0.24	-0.02	-1.44	0.68	-1.11		
2	1400.0	-11.84	8.62	11.07	-14.80	-28.14	12.83	21.26
	41000.0	10.76	11.53	12.56	10.54	7.28		
	2657.8	6.62	4.00	3.63	7.43	3.54		
2	1400.0	-13.33	9.57	12.61	-16.88	-31.64	11.03	24.97
	37000.0	10.70	11.65	13.41	10.24	5.95		
	5022.2	4.50	-1.47	-0.10	5.03	-0.77		
2	1500.0	0.42	20.58	19.77	-0.77	-14.90	4.03	21.43
	23000.0	12.42	17.56	16.36	15.33	4.69		
	3016.6	4.52	-3.44	-2.58	7.08	-3.37		
2	1500.0	-0.02	24.97	23.82	-1.42	-19.12	-16.71	26.15
	18500.0	3.77	13.99	15.08	7.60	-22.67		
	9251.7	3.76	-6.55	-4.53	5.93	-5.62		
2	1600.0	-0.66	2.99	-0.60	0.09	-7.06	-40.15	-19.32

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
2	17000.0	-25.14	-11.96	-11.28	-20.37	24.90		
	1770.8	-6.29	-8.09	-9.10	-4.54	-9.00		
3	1000.0	-7.49	-4.78	-1.86	-10.37	-11.61	0.70	1.10
	134000.0	0.41	-0.87	0.64	-0.69	0.44		
	1731.0	0.53	-0.23	0.73	-0.57	0.94		
3	1000.0	-12.86	-7.17	-2.41	-17.48	-20.00	1.58	2.89
	124000.0	0.97	-1.02	1.59	-0.91	0.54		
	8473.0	1.15	-0.49	1.66	-0.74	1.42		
3	1000.0	-15.52	-8.18	-2.33	-21.08	-24.24	2.29	4.39
	118000.0	1.49	-0.97	2.39	-0.93	0.71		
	21524.0	1.64	-0.70	2.44	-0.79	1.67		
3	1100.0	-12.60	-4.48	-2.30	-14.55	-18.74	1.28	2.43
	105000.0	0.94	0.85	1.32	0.66	-0.21		
	2327.0	1.00	0.51	1.24	0.75	0.41		
3	1100.0	-15.14	-4.35	-0.95	-18.10	-23.37	2.94	5.98
	94000.0	2.67	2.28	3.37	1.97	0.86		
	10606.2	2.35	0.85	3.11	1.75	0.57		
3	1100.0	-16.48	-3.66	0.68	-20.17	-26.20	4.17	9.40
	86000.0	3.85	3.24	5.02	2.71	1.15		
	32990.0	3.14	0.32	4.55	2.14	-0.27		
3	1200.0	-13.21	-4.83	-3.95	-14.08	-18.35	-3.44	-0.70
	78000.0	-2.04	-0.93	-1.97	-1.15	-3.45		
	3131.5	-3.16	-3.74	-2.36	-2.06	-6.45		
3	1200.0	-8.35	1.96	3.14	-9.47	-14.74	1.95	7.21
	68000.0	3.09	4.78	3.80	4.12	-0.22		
	7263.2	1.75	0.17	3.18	2.96	-3.34		
3	1200.0	-4.36	7.04	8.37	-5.61	-11.42	6.16	12.90
	63000.0	6.97	9.06	8.16	8.05	2.08		
	10232.3	5.63	3.46	7.42	6.85	-0.31		
4	1300.0	0.54	-2.12	0.21	-2.87	-0.90	-1.69	1.47
	67000.0	2.86	0.47	2.92	0.15	3.53		
	1209.0	3.28	1.52	1.48	0.81	12.19		
4	1300.0	2.58	-0.20	3.82	-0.63	1.47	0.56	3.24
	67000.0	4.60	2.37	4.60	2.02	5.33		
	1040.0	5.05	3.45	3.16	2.71	14.13		
4	1300.0	2.25	-0.23	4.98	-2.02	-0.27	-1.10	4.06
	62000.0	5.62	2.54	5.90	2.26	6.15		
	1904.0	6.00	3.59	4.37	2.91	15.01		
4	1300.0	3.91	1.34	6.38	-0.20	1.64	0.85	5.52
	62000.0	7.08	4.13	7.30	3.83	7.66		
	1687.0	7.47	5.20	5.75	4.49	16.65		
4	1450.0	-4.93	-0.47	0.71	-6.02	-10.09	-4.09	0.79
	38000.0	0.29	-0.16	0.95	0.22	-0.90		
	1136.0	1.58	1.46	2.36	1.53	7.39		
4	1450.0	-4.01	0.47	1.61	-5.06	-9.15	-2.78	1.70

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
4	38000.0	1.26	0.87	1.88	1.23	0.13		
	1063.0	2.55	2.49	3.27	2.53	8.50		
4	1450.0	-3.13	1.75	3.57	-4.75	-9.29	-8.71	3.62
	33000.0	1.79	0.43	3.31	1.21	-0.47		
	2639.0	3.42	2.31	5.17	2.77	7.86		
4	1450.0	-2.05	2.85	4.63	-3.64	-8.20	-6.98	4.69
	33000.0	2.98	1.71	4.43	2.45	0.82		
	2445.0	4.61	3.59	6.28	4.01	9.26		
6	1500.0	-7.77	-5.36	-3.57	-10.95	-11.46	-3.43	0.44
	40000.0	-1.85	-2.87	-1.47	-3.12	-1.59		
	1290.0	-1.83	-2.43	-1.39	-3.06	-1.45		
6	1650.0	6.44	19.59	15.22	15.28	0.10	15.95	20.69
	17000.0	15.98	17.01	15.20	17.78	14.68		
	1114.0	16.42	14.15	14.61	17.20	13.32		
7	1350.0	-3.87	8.91	23.72	-16.22	-24.37	5.32	37.55
	20000.0	23.19	14.59	28.11	12.16	18.56		
	20045.0	28.42	17.73	31.20	17.03	26.08		
7	1350.0	-12.61	-3.61	7.84	-22.37	-28.68	-2.15	17.77
	25000.0	8.75	1.50	11.37	0.50	5.83		
	10400.0	14.25	5.86	15.01	6.17	13.34		
7	1350.0	-21.89	-15.09	-5.81	-29.88	-34.96	-12.75	1.86
	30000.0	-4.51	-10.67	-2.92	-11.08	-6.59		
	7257.0	0.52	-6.32	0.60	-5.74	0.13		
7	1350.0	-20.37	-16.53	-9.30	-26.65	-30.31	-11.62	-4.27
	35000.0	-7.29	-12.67	-7.10	-12.20	-8.34		
	2980.0	-2.44	-7.82	-3.32	-6.83	-2.19		
7	1500.0	23.58	63.04	71.02	16.67	-4.52	19.77	112.66
	7000.0	50.73	62.24	74.12	46.60	32.69		
	13750.0	28.30	39.82	57.90	24.15	6.66		
7	1500.0	2.40	31.49	36.83	-2.32	-18.33	19.79	65.87
	10000.0	28.93	34.62	41.13	26.58	19.76		
	6180.0	14.48	20.85	30.42	12.30	1.03		
8	1200.0	-13.19	-7.99	-4.79	-17.32	-20.56	-1.08	2.28
	60000.0	-2.98	-5.11	-2.62	-4.80	-2.99		
	5094.0	-0.87	-2.02	0.47	-2.90	-0.48		
8	1200.0	-14.06	-7.74	-4.03	-18.84	-22.57	-1.31	4.18
	56000.0	-2.73	-5.14	-2.12	-4.93	-2.92		
	8638.0	-1.54	-4.27	-0.58	-4.11	-1.34		
8	1200.0	-6.18	2.86	7.94	-12.63	-17.63	7.76	19.23
	45000.0	7.77	4.63	9.08	4.51	7.07		
	20722.0	6.02	-3.44	5.03	1.85	5.40		
8	1200.0	-11.86	-4.02	0.42	-17.54	-21.96	1.43	10.29
	50000.0	0.86	-1.94	1.86	-1.93	0.37		
	15552.0	0.36	-5.81	0.31	-3.09	0.12		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
8	1300.0	1.90	18.06	18.78	-1.82	-9.92	5.92	25.60
	26000.0	10.10	12.57	12.07	10.82	7.35		
	21758.0	-12.28	-40.09	-32.43	-12.66	-19.94		
9	1000.0	0.02	-7.36	1.14	-6.43	-2.62		
	11000.0	2.91	-0.57	4.53	-2.35	4.96		
	3740.0	3.04	3.45	6.88	-1.31	5.66		
9	1200.0	-19.80	-12.62	-9.96	-21.13	-28.57	-5.90	-5.28
	70000.0	-8.30	-10.41	-7.83	-9.87	-10.07		
	1281.0	-7.88	-7.36	-5.52	-9.32	-6.17		
9	1200.0	-0.41	14.20	22.17	-5.18	-19.33	25.30	35.73
	40000.0	23.71	16.79	25.37	18.37	19.03		
	12138.0	24.23	18.32	27.31	19.25	25.19		
9	1300.0	-11.97	-2.78	-1.38	-12.78	-21.10		
	42500.0	0.67	-0.12	0.82	0.09	-0.54		
	1262.0	0.65	-0.42	0.38	1.44	0.30		
10	1000.0	-18.50	-34.02	-18.67	-29.51	-29.14		
	125000.0	-10.37	-22.55	-13.47	-18.60	-7.05		
	31050.0	-10.34	-15.69	-8.78	-17.80	-7.58		
10	1100.0	-34.64	-32.57	-22.48	-38.16	-48.79		
	105000.0	-17.13	-23.96	-17.13	-22.40	-18.21		
	13707.0	-13.39	-17.71	-12.15	-18.80	-12.50		
10	1100.0	-39.42	-34.28	-21.40	-44.56	-57.43	2.52	6.61
	95000.0	-14.49	-23.66	-14.38	-21.80	-16.11		
	24602.0	-9.73	-15.74	-8.03	-17.30	-8.32		
10	1200.0	-53.56	-35.05	-22.31	-56.28	-73.26	25.13	17.55
	60000.0	-13.80	-23.48	-12.51	-22.36	-18.51		
	32472.0	-7.62	-15.63	-5.52	-17.70	-5.20		
10	1300.0	-44.41	-17.44	-7.65	-44.46	-65.83	21.16	23.25
	35000.0	2.68	-5.54	2.72	-4.34	-2.90		
	14114.0	2.04	-4.10	3.42	-5.71	4.75		
10	1400.0	-26.92	3.58	12.65	-24.91	-54.16	-27.35	12.85
	15000.0	14.70	10.10	14.16	10.96	-4.47		
	12204.0	-8.08	-12.66	-6.55	-8.11	-19.38		
10	1400.0	-14.98	21.38	33.09	-12.62	-48.03	-22.13	34.80
	12000.0	29.60	26.42	32.35	25.70	21.09		
	14910.0	6.41	0.80	8.35	6.11	-6.24		
11	1615.0	-54.15	3.29	4.05	-53.10	-79.97		
	15000.0	-11.21	1.73	1.19	-3.65	-30.61		
	2269.0	-21.23	-19.40	-3.09	-12.24	-56.34		
11	1440.0	-58.02	-11.35	-5.84	-59.47	-82.29		
	40000.0	-9.22	-7.40	-1.71	-10.95	-23.23		
	1819.0	-2.48	-3.14	-1.13	-2.72	-7.51		
11	1010.0	2.58	-12.05	0.60	-12.90	-18.01		
	130000.0	6.80	-3.22	2.11	0.37	13.68		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
11	1596.0	4.46	0.41	2.44	-1.05	8.91		
12	1500.0	1.27	1.85	0.83	-1.89	-5.59	-24.98	1.83
	9000.0	1.69	-4.21	-2.26	0.52	-1.57		
	1420.6	4.81	-5.36	1.23	3.50	1.34		
13	1202.0	-6.16	-4.45	-2.95	-8.69	-8.31	-4.15	-1.12
	44800.0	-2.44	-3.73	-2.08	-3.67	-2.40		
	5270.0	-1.77	-2.44	-1.63	-2.75	0.08		
13	1202.0	-3.96	-1.43	0.34	-7.18	-6.83	-3.16	2.71
	40320.0	0.49	-1.35	1.12	-1.20	0.27		
	8171.0	1.31	0.03	1.82	-0.17	2.84		
13	1202.0	-1.50	2.01	4.10	-5.52	-5.21	-3.28	7.11
	35840.0	3.57	0.95	4.61	1.25	2.92		
	13386.0	4.61	2.45	5.68	2.45	5.59		
13	1292.0	7.34	12.98	11.68	5.96	4.20	0.59	13.79
	22400.0	9.09	7.95	10.13	8.60	7.05		
	10896.0	10.74	9.78	12.34	10.25	9.91		
14	1202.0	-15.09	-9.98	-4.47	-20.85	-23.95	2.16	3.88
	53760.0	-1.70	-5.46	-1.36	-4.88	-1.82		
	6443.0	0.13	-1.54	1.41	-2.81	1.12		
14	1202.0	-7.87	-3.60	1.85	-13.54	-16.41	8.71	10.13
	51520.0	4.89	1.12	5.12	1.80	4.92		
	5375.0	6.64	5.11	7.92	3.77	7.69		
14	1202.0	-15.45	-4.53	3.46	-23.69	-28.79	11.01	15.54
	44800.0	5.73	0.51	6.88	0.84	4.73		
	15294.0	8.46	5.19	10.28	3.87	9.47		
14	1292.0	-13.42	10.99	16.92	-19.05	-28.85	18.99	26.49
	29120.0	14.50	12.70	16.87	11.61	10.94		
	12094.0	17.17	14.35	17.56	14.69	16.49		
14	1292.0	-20.05	6.11	12.79	-26.25	-36.31	12.98	24.10
	28000.0	9.40	7.28	12.26	5.94	5.25		
	20399.0	11.06	6.94	11.36	7.98	9.68		
14	1382.0	-20.40	4.86	6.86	-23.07	-32.31	3.00	11.11
	22400.0	2.83	3.98	4.54	2.71	-0.51		
	7593.0	0.21	-1.12	-1.25	1.02	-2.48		
14	1382.0	-11.98	22.94	26.41	-16.20	-29.20	9.55	35.39
	15680.0	16.46	18.63	20.54	15.83	9.55		
	22159.0	8.54	0.95	5.08	8.85	-0.03		
14	1499.0	13.54	30.18	26.80	12.79	2.90	-7.54	19.42
	8960.0	13.85	22.08	18.41	18.60	2.73		
	6830.0	7.65	2.30	3.56	10.54	-0.44		
15	1201.0	-12.28	-0.47	5.39	-19.88	-27.16	3.70	7.72
	60480.0	8.08	3.80	7.31	5.20	8.04		
	25662.0	8.69	5.27	7.50	6.05	9.49		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	1381.0	-16.61	6.11	7.03	-19.19	-28.30	4.06	7.67
	35840.0	3.51	5.59	4.89	4.53	1.68		
	10736.0	2.08	4.07	3.88	3.60	0.33		
15	1381.0	-17.79	6.54	7.57	-20.81	-30.70	2.59	8.63
	33600.0	3.73	5.92	5.28	4.85	1.74		
	16172.0	1.24	3.44	3.83	2.77	-1.26		
15	1498.0	-0.28	16.25	11.99	-1.64	-11.87	-4.57	12.12
	15680.0	2.64	10.82	8.58	7.38	-4.35		
	25451.0	2.89	2.94	6.13	0.03	-10.19		
16	1111.0	-9.52	-8.23	-2.27	-16.53	-15.99	-1.33	4.67
	62720.0	-0.93	-5.46	0.50	-5.36	-1.30		
	2291.0	0.11	-3.37	1.55	-3.94	0.73		
16	1201.0	-7.18	5.35	5.24	-12.09	-17.09	6.02	15.59
	40320.0	5.68	2.86	6.65	3.61	2.80		
	2241.0	6.04	2.90	6.18	4.31	3.87		
16	1291.0	3.70	22.61	17.55	0.46	-7.23	-0.79	21.02
	22400.0	14.16	13.31	14.66	14.65	9.13		
	3134.0	11.19	5.88	10.07	11.17	3.84		
16	1291.0	8.12	27.31	22.05	4.96	-2.86	6.43	25.06
	22400.0	19.59	19.04	19.95	20.27	15.00		
	2456.0	16.82	12.37	15.68	17.11	10.14		
16	1291.0	25.11	50.41	44.22	20.20	9.97	-0.04	51.37
	15680.0	33.55	30.19	35.23	32.96	23.06		
	8411.0	28.81	16.45	27.27	27.04	14.66		
16	1381.0	30.18	41.58	36.10	29.70	23.39	24.04	47.48
	13440.0	28.44	30.57	28.04	31.81	23.21		
	1447.0	23.93	19.22	22.10	25.75	15.15		
16	1381.0	54.16	68.37	61.57	53.70	44.40	-5.32	77.24
	8960.0	32.97	29.00	35.80	35.00	4.39		
	5380.0	33.28	22.31	30.30	34.33	17.52		
16	1381.0	84.19	101.56	93.25	83.68	71.58	-30.34	113.21
	6720.0	43.13	27.41	50.01	41.94	46.99		
	9900.0	51.46	37.12	47.47	52.29	31.54		
17	1382.0	-24.16	-23.08	-16.35	-31.18	-35.67	-0.61	2.66
	49280.0	-10.53	-10.92	-6.77	-14.71	-7.82		
	1418.0	-10.57	-5.71	-1.68	-14.79	-7.93		
17	1472.0	-24.27	-14.35	-8.87	-29.72	-37.84		
	29120.0	-4.81	-6.23	-3.59	-7.56	-3.94		
	1508.0	-5.01	-3.96	-1.92	-7.85	-3.74		
17	1562.0	-11.88	2.15	5.42	-15.79	-25.37	20.45	19.83
	15680.0	8.20	8.46	8.69	7.35	8.91		
	1320.0	4.84	5.16	4.33	3.68	5.38		
17	1652.0	-29.91	-24.47	-24.50	-31.31	-36.46	-13.03	-8.92
	12320.0	-24.79	-22.57	-24.36	-24.15	-23.88		
	1178.0	-29.07	-33.74	-35.48	-29.16	-29.55		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
17	1652.0	-5.50	1.89	1.81	-7.46	-14.65	18.36	24.35
	8960.0	1.16	4.09	1.63	2.00	2.33		
	1250.0	-4.70	-11.67	-13.98	-4.89	-5.46		
18	1800.0	0.62	16.01	11.28	0.73	-8.94	-6.59	5.44
	13000.0	0.50	9.66	6.70	5.72	-9.90		
	1779.0	-4.71	-3.48	-1.01	-0.95	-12.62		
18	1800.0	2.01	18.98	13.52	2.31	-8.66	-10.82	7.07
	12000.0	-1.48	10.87	7.63	4.58	-19.37		
	2440.0	-3.90	-2.84	0.19	-0.13	-11.94		
18	1700.0	-14.96	8.29	7.31	-16.13	-26.02		
	25000.0	1.90	5.86	4.09	3.99	-1.60		
	1013.0	-2.91	-0.86	-1.20	0.44	-8.59		
18	1700.0	-12.59	18.21	16.38	-14.15	-27.86	5.25	16.32
	19000.0	4.88	12.53	10.56	8.34	-3.15		
	3468.0	-3.94	-2.60	0.66	0.51	-15.84		
18	1650.0	-19.17	6.18	6.22	-20.91	-31.81	20.52	7.46
	30000.0	0.02	3.79	2.91	1.45	-4.34		
	1322.0	-1.83	-0.46	-0.45	0.59	-6.36		
18	1500.0	-18.26	1.46	4.36	-22.00	-32.32	11.20	10.41
	50000.0	0.45	1.25	3.06	-0.46	-3.56		
	1584.0	4.19	2.86	4.80	3.14	2.82		
18	1500.0	-15.02	12.17	16.61	-20.69	-33.86	22.85	25.69
	40000.0	10.39	11.31	14.48	8.70	4.39		
	4355.0	13.68	11.20	15.18	11.90	10.60		
18	1350.0	-9.65	-8.09	-3.63	-15.57	-18.43		
	80000.0	-1.01	-4.93	-1.63	-3.76	-0.63		
	1468.0	-0.25	-2.53	-0.25	-2.92	0.63		
19	1700.0	-4.50	21.31	20.90	-4.08	-37.11	12.94	24.86
	15000.0	18.30	22.20	22.95	19.28	15.34		
	1896.0	19.70	23.26	19.94	19.02	14.02		
19	1700.0	-9.07	16.61	16.34	-8.72	-41.83	6.41	20.64
	15000.0	13.13	18.02	18.83	14.15	9.62		
	2376.0	14.45	18.71	15.92	13.87	8.08		
19	1700.0	-13.47	16.11	16.41	-13.36	-51.72	-9.38	23.09
	12500.0	8.46	20.67	21.82	10.02	-0.21		
	6905.0	9.68	19.22	18.81	9.61	-2.13		
19	1500.0	-10.45	2.86	7.11	-12.37	-35.86	0.25	2.82
	40000.0	7.49	-2.51	2.80	4.57	5.33		
	1738.0	9.12	-0.74	-0.36	5.21	9.39		
19	1500.0	-12.13	4.55	10.66	-15.50	-43.88	-1.17	6.21
	35000.0	11.02	-1.06	6.02	6.72	8.54		
	3765.0	12.73	1.04	2.82	7.39	13.13		
19	1500.0	-15.81	5.67	14.63	-21.13	-54.80	-9.46	10.00
	29000.0	14.20	0.63	10.20	7.67	10.82		
	12128.0	15.96	2.59	6.97	8.29	15.83		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
19	1500.0	-23.61	-1.95	7.47	-29.24	-61.89	-21.58	3.12
	29000.0	6.48	-6.12	3.68	-0.49	2.80		
	19862.0	8.10	-4.55	0.68	0.04	7.46		
19	1350.0	-5.26	-9.67	-2.26	-10.17	-21.63	-5.70	-3.90
	70000.0	0.08	-14.66	-6.39	-4.52	1.28		
	2380.0	1.41	-11.71	-9.25	-4.21	2.73		
19	1350.0	-6.12	-6.87	3.60	-13.93	-32.93	-4.52	1.03
	60000.0	6.31	-13.43	-2.10	-0.70	7.31		
	5832.0	7.82	-9.58	-5.21	-0.19	10.03		
19	1350.0	-6.74	-10.74	-3.16	-11.85	-23.93	-6.90	-4.85
	70000.0	-0.81	-15.83	-7.39	-5.55	0.38		
	2594.0	0.52	-12.82	-10.23	-5.23	1.91		
19	1350.0	-10.25	-8.06	4.58	-19.93	-43.04	-8.66	1.31
	55000.0	7.32	-15.20	-1.92	-1.54	8.02		
	12033.0	8.90	-11.03	-5.09	-0.91	11.66		
21	1498.0	-11.35	-14.11	-6.57	-18.16	-22.24	-4.97	-2.04
	53760.0	-3.58	-8.26	-2.96	-9.04	-1.41		
	1658.0	-3.42	-5.24	27.79	-8.87	-0.41		
21	1597.0	-20.12	-13.69	-6.11	-25.92	-37.62	-5.82	1.54
	35840.0	-4.47	-9.19	-3.65	-9.37	-4.37		
	2521.0	-4.25	-6.86	26.83	-9.15	-2.48		
21	1741.0	-15.98	-4.55	-1.01	-18.26	-31.85	-2.86	3.12
	22400.0	-0.68	-2.26	-0.44	-2.11	-1.33		
	1120.0	-0.71	-1.85	31.02	-2.10	-0.91		
22	1500.0	-5.24	3.29	2.60	-5.45	-10.19	2.55	4.82
	25000.0	-0.08	3.46	2.63	1.62	-1.67		
	1152.0	-3.61	0.10	0.95	-1.95	-7.25		
23	1100.0	-18.16	-5.41	-4.03	-2.30	-31.97	-7.99	-4.75
	75000.0	-1.61	-3.78	-0.54	-3.99	-3.85		
	19362.0	-0.80	-2.10	0.58	-2.84	-0.47		
23	1200.0	-24.87	-4.88	-8.00	-28.18	-39.16	-11.23	-4.95
	55000.0	-5.44	-5.55	-4.50	-6.19	-8.70		
	23550.0	-5.30	-6.90	-2.86	-5.73	-6.84		
23	1200.0	-23.66	-5.98	-9.17	-26.23	-36.11	-10.07	-6.69
	60000.0	-6.53	-6.42	-5.83	-6.96	-9.23		
	12342.0	-6.15	-6.60	-4.38	-6.24	-6.89		
23	1300.0	10.87	10.94	4.91	-12.66	-24.12	4.68	10.42
	35000.0	6.94	8.95	7.10	8.40	4.10		
	14207.0	5.65	2.80	9.65	7.13	1.05		
24	1400.0	4.23	3.76	8.49	-0.05	-20.08	5.85	6.75
	60000.0	9.88	3.09	5.16	7.10	11.36		
	1414.0	9.72	3.26	5.68	6.83	11.16		
24	1500.0	-26.72	-2.37	2.82	-32.26	-68.73	-10.45	2.96

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
24	35000.0	2.12	-2.38	1.59	-1.08	-0.13		
	9847.0	1.67	-2.90	1.34	-1.56	1.01		
24	1500.0	-5.75	7.66	10.30	-8.26	-36.23	8.33	10.22
	42000.0	10.69	7.79	8.86	9.13	9.39		
	1270.0	11.85	8.42	9.56	10.47	12.24		
24	1500.0	-15.28	0.49	3.66	-18.58	-48.82	0.05	3.64
	42000.0	3.98	0.61	2.22	2.09	2.59		
	2101.0	4.82	1.00	2.70	3.08	5.15		
24	1600.0	-19.48	13.34	14.82	-22.41	-63.56	4.23	18.28
	22000.0	12.32	13.44	16.21	12.25	8.91		
	5470.0	9.18	11.66	14.67	9.19	5.23		
24	1600.0	-22.81	5.52	6.66	-25.20	-62.07	0.11	9.65
	25000.0	5.09	5.74	7.71	5.02	2.34		
	3724.0	2.95	4.46	6.54	3.05	0.32		
24	1700.0	-18.48	17.13	14.76	-19.24	-62.10	5.68	21.75
	14000.0	7.83	16.50	18.76	12.02	2.91		
	4322.0	-0.09	12.88	15.96	3.74	-11.35		
24	1700.0	-19.04	7.46	5.60	-19.50	-53.44	6.05	10.75
	18000.0	3.27	7.54	8.22	5.82	1.37		
	1518.0	-1.65	5.18	6.15	0.97	-6.92		
24	1800.0	-17.39	12.21	6.47	-16.31	-58.72	-1.36	15.98
	9000.0	-11.44	9.75	11.51	-1.14	-32.71		
	3332.0	-16.89	6.31	9.57	-9.20	-30.71		
24	1800.0	-13.06	9.49	5.30	-12.57	-47.01	7.47	12.52
	11000.0	-2.74	8.22	8.65	3.73	-7.31		
	1189.0	-10.16	4.88	6.44	-4.78	-21.05		
				Cobalt Alloys				
1	1700.0	-9.28	-13.17	-10.65	-10.34	-19.18	-2.71	6.33
	8000.0	-7.25	-4.41	-6.22	-7.65	-5.89		
	103.0	0.19	-10.26	-7.96	0.96	-1.90		
1	1700.0	2.17	-2.97	0.52	0.54	-10.54	-1.62	24.12
	6000.0	4.19	0.98	-0.50	3.24	3.26		
	209.0	11.69	-8.40	-2.69	12.16	7.06		
1	1700.0	19.21	11.92	17.10	16.55	1.73	-22.39	52.75
	4000.0	20.70	-12.94	-7.06	18.63	11.87		
	599.0	21.90	-12.86	-5.50	19.27	9.13		
2	1350.0	-10.55	-24.88	-18.48	-14.87	-11.46		
	22500.0	-15.78	-19.44	-14.05	-18.59	-15.44		
	603.0	-14.02	-48.87	-13.90	-17.03	-13.92		
2	1500.0	-2.34	-1.36	-0.80	-2.19	-1.24	7.24	9.35
	15000.0	1.16	-2.96	-1.85	0.73	0.69		
	533.0	-2.12	-8.04	-7.75	-3.14	-3.21		
2	1500.0	-6.98	-5.59	-5.03	-6.78	-5.74	2.65	5.86
	15000.0	-2.55	-8.11	-6.65	-3.06	-3.19		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
2	666.0	-8.92	-11.04	811.64*	-10.98	-11.38		
2	1500.0	-5.45	-4.19	-3.63	-5.26	-4.25	4.19	7.02
	15000.0	-1.33	-6.39	-5.05	-1.81	-1.91		
	618.0	-6.50	-10.08	807.90*	-8.08	-8.32		
3	1500.0	-58.34	-14.96	-12.23	-58.10	-83.71	-29.59	-8.74
	14000.0	-18.25	-16.02	-12.26	-20.32	-29.02		
	2850.0	-22.40	-48.80	-19.49	-24.23	-27.42		
3	1600.0	-37.78	11.54	10.91	-35.37	-69.35	-11.05	6.79
	8000.0	0.98	9.19	11.39	2.07	-17.72		
	1671.0	-5.82	-36.40	-1.28	-4.91	-13.48		
3	1600.0	-19.78	13.42	13.05	-18.28	-45.70	4.99	8.05
	10000.0	10.95	12.68	13.01	11.32	6.74		
	582.4	2.55	-5.16	4.10	3.85	-1.06		
3	1600.0	-28.72	-2.38	-2.68	-27.58	-49.65	-8.72	-7.07
	12000.0	-3.98	-2.92	-2.76	-3.73	-6.82		
	505.5	-10.80	-15.82	-9.80	-9.70	-13.27		
3	1700.0	-6.21	19.19	16.27	-3.84	-31.74	9.06	12.74
	6000.0	9.85	17.76	17.30	13.14	-6.29		
	569.1	6.67	-8.17	9.46	8.33	1.99		
4	1200.0	6.64	7.86	10.07	4.75	-6.52	10.41	14.35
	38000.0	9.66	8.32	9.30	8.48	9.05		
	6473.0	8.56	6.52	7.01	7.65	8.05		
5	1350.0	-26.30	-34.25	-24.44	-33.93	-32.85	-41.66	-14.81
	25000.0	-26.39	-35.67	-24.23	-34.42	-26.18		
	25499.0	-25.60	-35.50	-23.63	-33.55	-25.39		
5	1350.0	0.35	-6.40	-0.41	-4.04	-0.32	2.58	5.49
	30000.0	0.37	0.25	4.69	-4.11	2.45		
	1031.0	-0.32	1.92	3.05	-4.19	2.01		
5	1350.0	-20.45	-27.35	-19.83	-26.22	-24.15	-22.95	-12.53
	30000.0	-19.89	-22.81	-15.96	-25.75	-18.29		
	4703.0	-20.01	-21.67	-17.04	-25.47	-18.37		
5	1500.0	-17.60	-20.60	-16.93	-20.55	-25.51	-21.51	7.93
	12500.0	-23.79	-38.18	-45.07	-26.75	-32.26		
	19651.0	-23.62	-100.00	-38.99	-26.60	-34.22		
5	1500.0	-22.06	-24.25	-21.28	-24.22	-28.77	-19.89	-1.63
	15000.0	-25.49	-39.69	-34.69	-27.80	-29.92		
	9154.0	-24.14	-41.84	-29.83	-26.78	-28.65		
5	1500.0	-25.03	-26.57	-24.15	-26.93	-30.81	-19.87	-8.52
	17500.0	-26.61	-33.35	-30.92	-28.43	-28.84		
	4566.0	-25.05	-33.70	-27.64	-27.20	-27.17		
5	1600.0	-6.86	-7.60	-8.94	-6.23	-11.31	7.38	16.07
	10000.0	-15.17	-27.67	-47.84	-13.73	-24.45		
	3248.0	-17.28	-100.00	38518.00*	-14.25	-35.03		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
5	1600.0	-4.87	-4.50	-5.60	-4.34	-8.81	9.03	10.35
	12000.0	-8.13	-12.46	-14.96	-6.95	-11.08		
	1010.0	-6.62	-12.58	-11.26	-5.55	-9.50		
5	1600.0	-18.90	-18.61	-19.65	-18.44	-22.27	-6.99	-5.75
	14000.0	-21.78	-25.71	-27.84	-20.77	-24.39		
	1042.0	-20.53	-25.86	-24.66	-19.59	-23.09		
6	1100.0	-10.45	-15.44	-9.19	-14.55	-11.15	0.26	0.83
	73000.0	-10.26	-9.30	-6.30	-13.89	-7.56		
	715.2	-11.16	-5.28	-2.63	-14.84	-2.16		
6	1100.0	-7.65	-12.90	-6.29	-12.11	-8.81	3.92	4.57
	70000.0	-7.41	-6.52	-3.22	-11.31	-4.57		
	799.3	-8.39	-2.23	0.72	-12.35	1.01		
6	1350.0	-13.69	-11.45	-13.54	-14.50	-22.30	-4.75	-5.21
	40000.0	-12.75	-12.46	-13.25	-12.36	-12.71		
	527.2	-11.85	-12.88	-14.19	-11.64	-7.65		
7	1350.0	-4.94	-2.48	-4.05	-5.19	-11.19	1.40	1.92
	40000.0	-4.11	-3.41	-2.27	-2.78	-5.48		
	548.5	-2.92	-2.38	-3.03	-1.95	-4.57		
7	1600.0	2.62	4.70	0.40	5.74	3.73	0.68	3.56
	18000.0	1.06	1.38	6.03	2.96	-2.48		
	911.1	2.45	4.01	4.74	4.95	-1.40		
9	1400.0	-4.22	-3.39	-1.15	-6.55	-6.82	1.70	2.88
	45000.0	-0.94	-2.44	-0.75	-2.31	-0.90		
	168.0	-0.19	-1.24	0.19	-1.54	0.15		
9	1500.0	13.62	18.51	19.36	12.36	9.74	24.09	25.53
	30000.0	17.90	18.21	18.44	17.85	17.08		
	133.6	16.24	15.56	16.20	16.29	15.20		
9	1500.0	9.76	15.29	16.42	8.04	5.09	19.82	24.15
	28000.0	13.55	13.89	14.74	13.13	11.99		
	322.3	10.28	7.98	10.41	9.77	7.93		
9	1600.0	2.74	5.77	4.67	2.74	0.72	2.65	5.08
	25000.0	2.38	3.83	3.18	3.17	1.06		
	160.5	-0.61	-1.73	-0.73	-0.16	-2.63		
10	1400.0	-26.20	0.83	4.30	-34.21	-96.47	4.04	-1.21
	45000.0	6.16	3.08	0.86	4.83	6.36		
	147.2	6.63	-0.41	-0.64	4.53	6.34		
10	1500.0	-21.83	11.40	13.69	-27.43	-93.72	11.22	15.99
	35000.0	14.01	12.91	10.91	13.29	11.77		
	111.6	14.78	9.68	8.89	13.46	13.86		
10	1600.0	-40.60	1.99	3.40	-45.15	-97.40	3.68	9.97
	30000.0	3.02	3.24	1.96	2.95	-0.57		
	160.8	3.79	1.02	0.51	3.24	2.34		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
10	1700.0	-52.15	-6.29	-6.13	-55.28	-98.57		
	25000.0	-6.73	-5.41	-5.62	-5.76	-10.40		
	207.8	-6.19	-6.00	-6.18	-5.76	-8.81		
10	1800.0	-61.49	-6.70	-8.27	-63.49	-99.59	4.38	2.96
	17500.0	-10.66	-7.02	-4.82	-7.18	-15.90		
	398.7	-10.70	-3.18	-4.40	-8.16	-19.36		
10	1800.0	-43.62	-4.76	-5.72	-45.31	-94.93	4.20	0.83
	20000.0	-5.81	-4.13	-3.71	-4.27	-7.88		
	116.7	-5.42	-2.15	-3.79	-4.51	-8.26		
10	1800.0	-45.16	-5.55	-6.53	-46.87	-95.61	3.50	0.22
	20000.0	-6.70	-4.95	-4.48	-5.08	-8.88		
	124.7	-6.34	-2.90	-4.53	-5.35	-9.39		
10	1800.0	-44.19	-5.06	-6.02	-45.89	-95.19	3.94	0.61
	20000.0	-6.14	-4.43	-4.00	-4.57	-8.25		
	119.6	-5.76	-2.43	-4.07	-4.83	-8.68		
10	1900.0	-47.63	-0.87	-3.65	-48.40	-97.76	10.26	5.57
	13000.0	-6.56	-1.95	0.88	-1.81	-11.10		
	190.6	-6.82	3.00	1.37	-3.26	-17.77		
10	2000.0	-48.28	1.63	-3.85	-47.34	-98.81	10.81	12.52
	8000.0	-29.21	-7.00	2.57	-13.06	47.82		
	294.8	-26.66	2.03	1.48	-13.33	-39.07		
10	2000.0	-47.96	-5.89	-10.40	-47.27	-98.09	1.46	2.45
	9000.0	-27.61	-12.29	-5.17	-16.05	20.93		
	224.6	-26.57	-4.97	-5.98	-16.87	-39.69		
11	1850.0	-18.45	-12.27	-10.68	-19.18	-31.08		
	10000.0	-6.31	0.54	-3.08	-6.76	-1.92		
	804.9	2.89	3.83	1.34	4.75	5.01		
11	1800.0	-19.78	-12.30	-8.73	-21.79	-36.90		
	10000.0	-3.04	4.61	1.35	-4.89	2.59		
	2223.9	8.66	8.19	6.89	9.90	9.92		
11	1800.0	-25.12	-17.79	-14.00	-27.26	-42.24		
	10000.0	-8.74	-1.49	-4.66	-10.81	-3.41		
	3218.0	3.27	2.04	1.30	4.52	3.53		
11	1750.0	-21.50	-14.72	-10.77	-23.96	-37.97		
	13000.0	-4.46	1.83	0.07	-6.64	0.92		
	1571.1	4.65	4.99	3.83	4.67	8.01		
11	1625.0	-25.07	-21.32	-17.94	-27.47	-36.80		
	25000.0	-13.71	-12.12	-11.61	-15.62	-11.53		
	592.3	-11.09	-9.75	-10.60	-12.46	-5.53		
11	1600.0	2.58	6.80	11.60	-0.90	-12.57		
	20000.0	16.91	18.58	19.57	14.16	19.60		
	574.9	19.83	21.75	20.67	17.71	27.69		
11	1500.0	-19.25	-19.44	-11.38	-25.68	-33.06		
	30000.0	-6.53	-4.67	-2.18	-11.55	-2.44		
	1720.9	-3.48	-2.20	-1.82	-8.37	4.22		

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
11	1450.0	-21.68	-24.23	-14.75	-29.55	-34.25		
	35000.0	-10.28	-8.17	-5.08	-16.27	-5.46		
	2404.3	-8.36	-5.84	-5.02	-12.72	1.03		
11	1325.0	-5.22	-16.37	-6.90	-14.24	-1.42		
	50000.0	-5.61	-0.44	1.10	-11.39	0.99		
	1190.7	-1.43	2.13	1.54	-4.88	8.16		
12	1350.0	-0.10	-1.92	2.62	-4.96	-5.31	3.38	5.90
	27500.0	2.71	2.38	4.40	0.33	3.83		
	679.2	2.15	3.81	5.67	1.14	5.10		
12	1700.0	-6.88	-3.59	-6.04	-6.34	-10.65	-9.26	-2.80
	10000.0	-6.93	-7.74	-10.99	-5.11	-9.10		
	552.8	-3.59	-18.82	-7.97	-1.52	-7.07		
13	1500.0	-11.41	-6.59	4.12	-25.06	-27.91	12.79	17.12
	14000.0	9.72	6.66	13.14	2.96	12.79		
	2338.0	11.17	9.32	14.45	4.51	14.48		
14	1200.0	-10.43	-9.78	-2.73	-18.19	-22.50	-17.20	-7.08
	40000.0	-2.11	-6.73	-2.96	-5.82	-1.94		
	1160.0	-1.86	-4.75	-4.30	-5.30	-0.45		
14	1200.0	-10.80	-10.10	-3.00	-18.60	-22.95	-17.75	-7.66
	40000.0	-2.41	-7.05	-3.24	-6.14	-2.26		
	1199.0	-2.16	-5.08	-4.57	-5.62	-0.77		
14	1200.0	-11.61	-10.82	-3.63	-19.53	-23.98	-18.99	-8.96
	40000.0	-3.08	-7.76	-3.87	-6.87	-2.98		
	1295.2	-2.84	-5.83	-5.18	-6.36	-1.48		
14	1200.0	-14.07	-12.98	-5.51	-22.30	-27.02	-22.78	-12.84
	40000.0	-5.12	-9.91	-5.77	-9.07	-5.15		
	1636.1	-4.89	-8.09	-7.03	-8.58	-3.65		
14	1200.0	-8.72	-7.52	0.49	-17.55	-22.62	-18.23	-7.63
	37500.0	0.89	-4.24	0.22	-3.35	0.83		
	1693.6	1.13	-2.32	-1.12	-2.83	2.44		
14	1200.0	-10.23	-8.05	1.39	-20.60	-26.78	-25.57	-13.29
	35000.0	1.24	-4.60	1.07	-3.85	0.68		
	3445.5	1.45	-3.01	-0.16	-3.40	2.33		
14	1200.0	1.90	4.31	14.91	-9.75	-16.68	-15.02	-1.28
	31000.0	14.78	8.21	14.55	9.07	14.19		
	3294.0	15.03	10.04	13.15	9.59	16.06		
14	1200.0	-11.17	-6.67	6.47	-25.15	-33.72	-47.02	-22.98
	29000.0	4.46	-3.24	6.04	-3.06	2.24		
	17867.6	4.45	-3.22	5.17	-3.03	3.45		
14	1200.0	-1.55	2.54	15.63	-15.66	-24.28	-32.11	-11.43
	28000.0	14.23	6.43	15.20	6.90	12.50		
	10192.3	14.33	7.20	14.08	7.14	14.11		
14	1200.0	-5.08	0.02	14.58	-20.50	-29.94	-46.88	-18.77

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
14	26500.0	12.11	3.63	14.11	3.73	9.47		
	21789.6	12.07	3.35	13.23	3.68	10.63		
14	1350.0	-26.69	-17.56	-13.64	-31.72	-41.34	-36.50	-29.39
	29000.0	-15.42	-15.62	-14.02	-16.09	-17.99		
	1969.1	-15.59	-16.63	-14.42	-16.18	-17.87		
14	1350.0	-23.33	-13.69	-9.53	-28.68	-38.83	-34.09	-26.32
	27500.0	-11.45	-11.68	-9.93	-12.18	-14.19		
	2098.8	-11.65	-12.81	-10.33	-12.31	-14.14		
14	1350.0	-28.82	-18.53	-13.65	-35.00	-45.59	-47.57	-33.83
	26000.0	-16.54	-16.97	-14.03	-17.76	-20.04		
	5654.4	-17.01	-19.35	-14.03	-18.40	-21.21		
14	1350.0	-26.63	-15.94	-10.83	-33.09	-44.09	-46.72	-31.95
	25000.0	-13.91	-14.36	-11.22	-15.21	-17.59		
	6055.2	-14.42	-16.93	-11.20	-15.90	-18.90		
14	1500.0	-14.67	-1.89	-1.87	-17.35	-28.57	-15.17	-20.20
	17000.0	-4.36	-0.99	-2.15	-1.81	-6.98		
	1157.1	-5.47	-4.86	0.68	-3.49	-11.40		
14	1500.0	-15.14	-2.38	-2.35	-17.84	-29.05	-15.97	-20.66
	17000.0	-4.89	-1.52	-2.62	-2.34	-7.56		
	1203.2	-6.02	-5.44	0.20	-4.05	-12.03		
14	1500.0	-18.96	-6.28	-6.26	-21.72	-32.95	-22.56	-24.37
	17000.0	-9.22	-5.77	-6.49	-6.74	-12.28		
	1661.8	-10.42	-10.21	-3.64	-8.63	-17.20		
14	1500.0	-19.41	-6.75	-6.73	-22.19	-33.41	-23.37	-24.81
	17000.0	-9.74	-6.28	-6.96	-7.28	-12.86		
	1729.4	-10.96	-10.79	-4.10	-9.18	-17.82		
14	1500.0	-19.65	-6.99	-6.97	-22.43	-33.65	-23.78	-25.04
	17000.0	-10.01	-6.54	-7.19	-7.55	-13.15		
	1764.7	-11.23	-11.09	-4.34	-9.46	-18.14		
14	1500.0	-19.89	-7.24	-7.22	-22.67	-33.90	-24.22	-25.27
	17000.0	-10.29	-6.82	-7.44	-7.83	-13.46		
	1802.8	-11.51	-11.39	-4.59	-9.76	-18.48		
14	1500.0	-21.12	-8.51	-8.49	-23.93	-35.14	-26.44	-26.47
	17000.0	-11.71	-8.21	-8.69	-9.28	-15.03		
	2010.3	-12.95	-12.97	-5.84	-11.26	-20.17		
14	1500.0	-18.61	-4.58	-4.57	-21.90	-34.49	-31.85	-24.42
	15000.0	-9.36	-5.18	-4.71	-6.84	-14.32		
	3883.8	-10.87	-11.77	-1.50	-9.38	-20.73		
14	1500.0	-10.64	6.83	6.82	-15.05	-30.84	-47.56	-17.59
	11500.0	-2.52	3.52	6.86	-0.07	-13.12		
	13018.2	-4.45	-7.73	10.78	-3.58	-20.47		
15	1400.0	-7.34	-10.82	-7.76	-9.97	-10.52	-5.26	-3.16
	45000.0	-6.94	-10.87	-7.96	-9.53	-6.29		
	1709.0	-6.41	-10.35	-8.58	-9.03	-5.58		
15	1600.0	-7.81	-3.52	-3.24	-7.18	-16.17	0.52	4.47

Table 28. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	20000.0	-5.31	-3.46	-2.85	-4.65	-7.88		
	1309.0	-6.40	-4.27	-2.69	-5.59	-9.39		
16	1800.0	-62.01	0.19	-4.34	-54.60	-99.56	-258.10	94695.00*
	7000.0	-15.99	-8.19	-16.53	-55.98	244.10		
	2535.0	-8.40	6.14	11.34	-6.38	-19.61		
17	1050.0	-11.52	-21.70	-16.90	-14.73	-14.42		
	60000.0	7.31	-3.07	1.95	6.30	6.79		
	1693.0	7.92	-24.47	2.08	6.98	7.78		
17	1050.0	-25.71	-38.29	-32.18	-29.88	-29.28	-14.44	-7.06
	55000.0	-12.36	11.09	-2.03	-18.24	-15.82		
	5388.0	-8.99	-43.47	-40.29	-15.74	-14.08		
17	1000.0	-17.10	-33.58	-24.12	-23.20	-21.18		
	62000.0	5.77	-15.06	-0.26	2.22	5.24		
	4244.0	6.42	-44.77	0.11	3.00	6.22		
18	1100.0	-3.27	1.66	-0.35	-3.81	-5.35	-1.39	-0.45
	55000.0	-1.90	-2.27	-0.28	-1.44	-2.89		
	1465.0	0.48	2.73	2.62	0.58	-0.99		
18	1100.0	1.96	7.39	5.21	1.29	-0.40	3.09	5.05
	50000.0	2.63	1.42	5.18	2.86	1.00		
	2414.0	5.26	8.28	8.43	5.13	3.05		
18	1050.0	-4.69	0.68	-0.53	-6.22	-7.53		
	60000.0	-2.03	-3.06	-0.33	-2.23	-2.98		
	3032.0	0.16	1.62	2.34	-0.38	-1.22		
18	1050.0	-5.23	0.17	-1.04	-6.78	-8.10		
	60000.0	-2.63	-3.74	-0.85	-2.86	-3.63		
	3250.0	-0.39	1.11	1.87	-0.97	-1.83		
18	1050.0	1.74	7.72	6.41	-0.02	-1.46	5.37	6.65
	55000.0	4.39	2.94	6.59	4.04	3.16		
	3946.0	6.98	8.75	9.71	6.23	5.24		

* Not Included in the Averaged Values.

Table 29. Average Values of Percentage Deviation of Stress (Equation 23) for Internal Extrapolation: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	7.92	7.61	8.04	8.50	8.30	22.46	13.42
Rank	2	1	3	5	4	7	6
				Ferritic Steels			
Value	6.90	8.15	7.27	7.82	6.35	11.20	11.92
Rank	2	5	3	4	1	6	7
				Aluminum Alloys			
Value	7.32	8.98	6.56	8.97	10.40	9.49	14.86
Rank	2	4	1	3	6	5	7
				Nickel Alloys			
Value	8.42	9.53	9.85	8.42	7.49	8.32	15.01
Rank	3	5	6	3	1	2	7
				Cobalt Alloys			
Value	9.28	9.03	8.61	9.61	12.89	15.01	12.04
Rank	3	2	1	4	6	7	5
				All Data			
Value	7.98	8.66	8.20	8.62	8.85	13.32	13.56
Rank	1	4	2	3	5	6	7

Table 30. Average Values of Percentage Deviation of Stress (Equation 23) for Internal Extrapolation: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	7.56	7.89	8.11	7.91	7.85	22.46	13.43
Rank	1	3	5	4	2	7	6
				Ferritic Steels			
Value	7.41	5.62	5.58	7.72	6.25	11.20	11.92
Rank	4	2	1	5	3	6	7
				Aluminum Alloys			
Value	4.72	7.46	5.13	6.79	6.42	9.49	14.86
Rank	1	5	2	4	3	6	7
				Nickel Alloys			
Value	7.67	7.31	8.73	7.14	7.80	8.32	15.01
Rank	3	2	6	1	4	5	7
				Cobalt Alloys			
Value	9.21	13.05	8.05	9.14	11.35	15.01	12.04
Rank	3	6	1	2	4	7	5
				All Data			
Value	7.37	8.11	7.28	7.71	7.89	13.32	13.56
Rank	2	5	1	3	4	6	7

Table 31 lists the percentage deviation of rupture-time, as defined by Equation 24. For each single long-time data point involved with the internal extrapolation there are entries. Compared are the actual and predicted values of rupture-times for these long-time data points, as calculated by the computer from known values of temperature and stress.

It should be noted that it was not possible to make nearly as many extrapolations by the Conrad and Korchynsky methods as were possible by the utilization of the other five correlation methods. The Conrad and Korchynsky methods were not used for extrapolation unless there were at least three other data points (short-time) at the same temperature as the point to be extrapolated.

Averaged values of the percentage deviation of rupture-time are listed in Tables 32 and 33 for the case of second and third order polynomial approximations to master curves, respectively. Included in Tables 32 and 33 are averaged values for only the Larson-Miller, Manson-Haferd, Sherby-Goldhoff, Manson-Succop, and Sherby-Dorn methods: thus, the averages for the Conrad and Korchynsky methods have been omitted. This was necessary because some of the individual numbers are so very large, when dealing with the Conrad and Korchynsky methods, that their influence is overriding. The Conrad and Korchynsky methods are not able to extrapolate with the degree of precision of the other methods. For the similar obvious reasons the averaged values did not include those results marked by asterisks in Table 31.

Table 31. Percentage Deviation of Rupture-Time (Equation 24): Internal Extrapolation.

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1050.0	-56.20	-67.03	-49.10	-67.23	-60.95		
	30000.0	-48.18	-52.14	-34.42	-60.30	-40.05		
	13629.7	-54.37	-50.79	-41.71	-65.34	-41.33		
1	1050.0	-56.52	-68.42	-44.32	-70.86	-65.90	-19.72	15.29
	27000.0	-44.03	-53.01	-27.28	-60.51	-35.89		
	32505.5	-50.64	-51.76	-35.05	-65.51	-37.28		
2	1050.0	133.62	101.93	160.05	89.12	90.34	15.28	56.70
	24000.0	123.11	79.96	133.14	93.58	119.52		
	7863.0	126.98	84.75	141.85	96.40	119.55		
2	1200.0	-56.98	-49.36	-56.12	-55.09	-67.36	-51.84	-45.12
	15500.0	-58.61	-39.85	-45.26	-54.06	-63.04		
	9752.1	-54.45	-27.81	-35.01	-49.12	-63.00		
3	1050.0	20.72	34.83	68.07	-3.61	-14.19	-18.35	12.36
	24000.0	50.48	26.96	66.73	35.04	43.30		
	11858.5	43.32	23.65	68.42	28.46	32.59		
3	1200.0	-57.52	-36.08	-43.05	-58.92	-69.46	-35.87	-24.63
	16500.0	-48.20	3.86	-35.40	-43.12	-52.68		
	10646.4	-54.57	-6.33	-33.74	-50.62	-62.43		
3	1200.0	-51.69	-23.57	-33.35	-53.63	-67.20	-36.42	-9.09
	15000.0	-41.78	55.43	-17.66	-36.10	-49.04		
	18208.1	-51.20	36.16	-14.90	-47.31	-62.85		
4	1350.0	-39.83	-41.52	-35.83	-43.70	-36.66	-56.43	-53.72
	9000.0	-43.63	-52.74	-47.19	-47.45	-41.38		
	1429.0	-44.20	-46.49	-41.34	-49.17	-41.07		
4	1350.0	-43.23	-47.38	-40.97	-47.59	-40.44	-66.38	-60.52
	8000.0	-45.80	-54.33	-45.62	-51.24	-45.45		
	2127.0	-40.40	-45.74	-36.29	-48.22	-37.21		
4	1350.0	-59.31	-62.29	-57.69	-62.40	-57.32	-75.91	-71.71
	8000.0	-61.16	-67.27	-61.03	-65.06	-60.91		
	2968.0	-57.29	-61.12	-54.34	-62.89	-55.00		
4	1350.0	-19.26	-33.37	-21.10	-27.80	-16.03	-72.49	-56.12
	6000.0	-11.81	-21.77	13.45	-28.96	-21.34		
	3429.0	29.66	0.43	43.83	-1.90	31.75		
4	1350.0	27.12	-2.54	19.41	11.31	31.47	-70.60	-40.91
	5000.0	61.36	52.22	158.00	19.16	29.42		
	3685.0	185.79	93.18	222.51	95.15	176.00		
4	1500.0	-53.64	-59.83	-63.02	-50.20	-55.87	-62.58	-52.36
	4000.0	-49.56	-34.81	-28.80	-50.63	-58.32		
	2586.0	-23.33	-29.47	-23.96	-26.40	-28.10		
4	1500.0	-60.76	-65.03	-67.78	-57.24	-61.87	-72.55	-58.54
	3500.0	-49.24	-30.07	-18.43	-52.26	-60.87		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
4	4360.0	-15.76	-26.95	-16.48	-22.14	-23.36		
4	1500.0	-59.12	-62.38	-65.29	-54.70	-58.89	-76.54	-55.41
	3000.0	-33.38	0.07	27.07	-40.55	-53.20		
	6310.0	18.55	-6.01	16.58	4.40	1.74		
4	1650.0	-45.56	-36.42	-43.79	-36.40	-41.97	-24.42	-13.74
	2500.0	-18.24	11.16	9.20	-16.90	-31.64		
	1260.0	8.59	10.11	5.31	13.97	3.77		
4	1650.0	-64.12	-50.01	-57.82	-55.21	-58.36	-52.84	-25.02
	2000.0	-18.31	26.36	27.96	-18.80	-38.56		
	3320.0	1.91	-7.36	-5.21	5.07	-13.75		
5	1200.0	12.09	-22.68	11.63	-18.33	-10.35	103.43	393.18
	15000.0	21.34	-3.41	29.66	-4.23	26.51		
	23146.4	27.51	8.31	36.41	0.36	34.34		
5	1350.0	33.82	17.25	16.65	27.60	0.20	-2.84	47.30
	7000.0	39.92	4.80	0.97	42.63	26.00		
	13848.2	18.36	-36.78	-42.42	24.76	7.37		
6	1050.0	-53.58	98.08	-38.17	-62.15	-62.65	-2.14	35.17
	31500.0	-29.54	82.72	-23.29	-43.15	-25.61		
	16943.9	-20.47	85.39	-8.00	-36.57	-15.06		
6	1200.0	-36.55	-13.19	20.65	-42.16	-56.85	1.90	66.80
	15500.0	7.78	7.61	6.70	8.90	2.46		
	13506.6	-26.34	-16.28	-33.52	-23.95	-31.55		
7	1050.0	-74.60	-70.46	-61.20	-77.67	-74.55	-66.01	-59.68
	34000.0	-49.73	-61.91	-52.25	-56.66	-50.31		
	11534.2	-40.01	-58.95	-49.93	-48.13	-35.99		
7	1050.0	-76.86	-67.06	-56.88	-80.67	-82.85	-65.46	-51.99
	31500.0	-42.68	-57.56	-43.14	-52.56	-44.92		
	18285.8	-32.14	-54.31	-40.66	-43.45	-29.03		
8	1200.0	-45.50	-2.23	-5.22	-47.05	-59.63	-26.63	-5.84
	15500.0	-15.89	-9.50	-16.45	-7.47	-21.98		
	10286.2	-11.11	-10.08	-1.64	-5.80	-24.92		
9	1050.0	-44.43	-53.25	-38.18	-54.40	-52.10	113.53	262.30
	35000.0	-39.96	-46.26	-32.40	-50.11	-35.78		
	15181.9	-39.78	-39.77	-18.52	-52.37	-29.62		
9	1200.0	-3.28	2.07	4.74	-9.90	-30.39	85.65	208.20
	16000.0	5.75	-3.53	2.88	2.71	-1.54		
	11624.0	5.60	-11.75	-10.86	5.51	-5.18		
10	1050.0	-8.44	11.15	66.39	-29.62	-36.68	162.23	352.07
	31000.0	57.15	24.36	67.84	27.02	49.79		
	14912.0	93.87	47.37	97.77	56.52	98.75		
10	1200.0	-25.39	61.60	54.67	-29.06	-52.99	69.94	189.89

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
10	16000.0	13.18	38.95	33.26	22.12	-2.90		
	13698.7	-34.55	-64.60	-67.55	-27.51	-45.30		
11	1200.0	-38.31	-68.90	-25.12	-67.90	-49.00	-92.93	485.30
	16000.0	-25.61	-32.03	16.03	-57.65	-9.19		
	13689.0	-28.57	-18.79	28.12	-57.96	-11.89		
11	1400.0	10.64	-13.69	10.18	-8.09	-16.13	-41.18	93.63
	8000.0	6.41	-26.12	-20.86	-7.64	-9.85		
	13696.0	-30.61	-65.81	-63.64	-36.78	-39.27		
12	1200.0	-24.62	-62.53	-39.17	-54.26	-40.52	-35.29	19.34
	12500.0	-42.58	-52.22	-28.32	-57.99	-37.02		
	12501.8	-42.52	-43.19	-21.41	-58.25	-36.63		
12	1400.0	192.35	65.76	79.73	141.28	103.84	-23.10	109.64
	4000.0	173.98	20.10	39.18	132.53	108.94		
	10267.1	172.96	-35.89	-31.57	136.55	105.76		
13	931.0	-33.29	-84.20	-54.23	-69.47	-18.33	259.70	599.60
	49780.0	-43.88	-46.76	58.38	-75.11	-3.02		
	15666.0	-44.73	26.38	266.18	-75.82	-6.16		
13	1021.0	-48.05	-69.17	-51.41	-60.99	-48.49		
	42670.0	-44.25	-48.56	-22.57	-60.42	-33.70		
	2891.4	-41.24	-22.29	12.04	-57.49	-26.30		
13	1111.0	-20.94	-12.38	20.96	-33.48	-44.99	10.49	28.82
	28450.0	35.40	6.14	36.90	10.83	31.46		
	1652.1	43.95	30.15	53.85	22.48	52.17		
13	1111.0	-7.87	6.02	69.91	-30.10	-45.85	16.30	97.26
	24180.0	76.21	20.57	73.93	32.49	64.34		
	3937.5	81.27	20.45	59.37	39.68	78.43		
13	1111.0	-28.72	-17.97	31.47	-45.90	-58.10	-10.01	52.63
	24180.0	36.34	-6.71	34.58	2.52	27.16		
	5088.8	40.26	-6.80	23.31	8.08	38.06		
13	1201.0	-28.28	3.07	14.10	-32.45	-52.60	-0.64	20.10
	19920.0	20.37	6.52	10.16	17.27	12.91		
	1202.5	18.79	-5.62	-6.32	16.03	11.78		
13	1201.0	11.77	64.41	97.74	0.59	-33.66	17.48	98.33
	17070.0	78.79	45.11	54.55	69.66	59.58		
	1930.7	70.93	-1.77	4.60	59.46	47.25		
13	1336.0	160.75	187.97	137.38	182.20	111.73	-22.71	40.18
	8530.0	32.52	-2.53	-11.31	48.43	-1.20		
	1071.0	41.10	-16.62	-24.98	62.63	13.05		
14	1111.0	-46.52	-41.19	-31.56	-55.54	-52.11	-35.43	-31.24
	24640.0	-27.80	-37.47	-24.74	-36.88	-26.95		
	20437.0	-29.56	-38.82	-27.32	-38.16	-28.63		
14	1111.0	-36.22	-21.13	-6.75	-50.55	-46.35	-28.91	-4.10

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
14	22400.0	-11.62	-26.47	-2.64	-26.73	-13.55		
	43016.0	-20.33	-34.21	-12.15	-34.25	-21.98		
14	1156.0	13.45	71.18	64.14	-2.62	-6.45	29.13	128.37
	19040.0	36.24	28.42	50.86	25.21	27.14		
	20582.0	14.81	5.67	30.62	3.31	6.82		
14	1201.0	91.82	150.80	133.49	79.51	67.32	27.34	102.80
	15680.0	59.25	60.44	79.71	53.53	42.91		
	13953.0	43.34	41.59	70.73	35.37	27.71		
15	1111.0	-48.41	-60.70	-25.28	-70.85	-69.35		
	33600.0	11.26	-37.05	11.09	-24.07	35.30		
	15246.0	2.20	-25.79	13.68	-29.41	13.44		
15	1201.0	-52.52	20.27	121.12	-71.02	-81.13	91.64	221.90
	22400.0	111.34	72.95	138.19	72.73	64.64		
	17896.0	104.73	62.27	125.17	68.09	71.05		
15	1201.0	-53.61	17.51	116.05	-71.69	-81.56	87.25	214.50
	22400.0	106.50	68.99	137.73	68.73	60.87		
	18316.0	100.03	58.54	120.01	64.24	67.13		
15	1201.0	-73.72	-45.30	-10.00	-82.35	-87.59	-2.96	20.02
	24640.0	-7.81	-22.73	0.33	-21.78	-23.69		
	19200.0	-7.62	-23.27	-0.98	-22.18	-16.58		
15	1291.0	-79.88	-19.69	5.79	-84.75	-91.42	32.01	67.92
	17920.0	-10.57	1.09	-2.27	-6.87	-36.24		
	17579.0	-12.40	-13.43	-10.43	-7.92	-29.86		
15	1291.0	-79.44	4.73	47.79	-85.84	-92.85	36.40	179.55
	15680.0	13.44	29.06	27.07	17.44	-23.46		
	34381.0	2.78	-0.37	7.36	9.97	-27.40		
16	1021.0	25.76	-37.56	17.25	-15.92	40.58		
	35840.0	23.89	-11.98	28.91	-18.14	59.04		
	11011.0	23.00	4.29	46.06	-19.93	57.01		
16	1021.0	77.60	-10.29	99.90	5.57	68.15		
	31360.0	100.70	25.94	122.97	18.70	139.98		
	15384.0	116.04	58.65	169.84	24.49	168.07		
16	1111.0	12.69	4.99	70.43	-19.07	-26.67	-15.02	34.84
	20160.0	59.78	16.94	80.02	17.99	44.45		
	18302.0	83.06	38.05	104.27	33.11	82.60		
16	1111.0	83.16	78.67	251.14	13.44	-6.19	-14.78	144.50
	15680.0	185.56	79.32	257.40	86.29	127.04		
	37604.0	207.40	84.63	257.46	100.33	167.18		
16	1201.0	-38.30	-19.83	-9.80	-44.73	-60.59	-32.72	-22.83
	15680.0	-12.60	-19.81	-7.73	-17.49	-24.47		
	10960.0	-5.34	-13.39	-4.70	-10.22	-10.90		
16	1201.0	-8.80	22.33	45.32	-22.33	-47.64	-21.49	19.81
	13440.0	32.81	16.18	45.49	21.06	8.81		
	14923.0	36.28	13.71	38.40	25.71	19.23		
16	1201.0	14.89	60.00	102.69	-7.85	-41.85	-31.30	59.93

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
16	11200.0	68.23	38.10	94.88	46.81	27.15		
	27095.0	60.67	17.07	65.06	43.00	25.85		
16	1201.0	42.22	107.36	184.20	6.00	-38.32	-50.90	112.52
	8960.0	101.48	51.36	154.40	66.13	34.45		
	60254.0	76.52	5.26	84.38	49.49	17.25		
16	1291.0	-14.81	37.81	31.20	-19.80	-55.02	-54.97	20.16
	6720.0	0.02	-4.40	14.53	4.31	-28.80		
	37958.0	-17.53	-40.08	-20.25	-12.34	-45.19		
16	1381.0	111.69	207.60	139.90	131.99	44.46	-8.94	160.52
	4480.0	80.31	93.38	99.23	110.97	32.09		
	10269.0	52.98	17.45	44.59	77.47	1.14		
16	1471.0	180.33	201.80	97.08	276.28	174.59	-48.21	166.62
	2240.0	13.06	18.11	36.79	38.17	-34.20		
	16629.0	69.01	35.93	59.65	94.63	20.01		
17	1112.0	-50.55	-66.90	-47.43	-62.90	-49.77	-43.11	-25.07
	22400.0	-44.87	-52.70	-37.19	-58.40	-35.41		
	10430.0	-42.18	-40.53	-28.57	-56.51	-29.34		
17	1112.0	-48.46	-65.80	-32.09	-68.37	-58.36	-64.77	2.24
	15680.0	-33.70	-54.02	-20.70	-57.30	-28.81		
	41836.0	-31.35	-46.60	-14.16	-55.76	-23.22		
17	1202.0	-14.52	-16.80	30.49	-44.10	-49.40	-78.17	24.84
	6720.0	4.83	-33.74	13.03	-24.80	-15.67		
	82557.0	-1.59	-49.85	-4.90	-29.39	-24.17		
17	1292.0	-15.00	-1.13	2.99	-23.91	-38.01	-32.03	60.84
	6720.0	-1.56	-10.17	-2.91	-4.55	-11.02		
	11404.0	-7.00	-26.83	-13.75	-10.04	-19.75		
17	1292.0	64.29	91.52	109.30	38.39	9.17	47.30	250.30
	4480.0	65.76	25.69	63.31	48.63	28.39		
	25382.0	55.16	-12.17	34.57	38.12	13.02		
17	1382.0	138.89	171.07	136.80	147.90	92.87	-63.88	199.09
	2240.0	49.81	5.05	40.56	44.01	-2.83		
	29069.0	64.84	-3.59	35.99	58.37	16.73		
18	1112.0	-53.60	-43.03	-38.11	-60.26	-57.63	-58.50	-45.92
	42560.0	33.46	-4.29	20.39	14.12	21.09		
	21712.0	1.40	-9.38	12.13	-9.92	-2.90		
18	1202.0	-90.09	-80.88	-86.22	-90.18	-91.36	-81.56	-82.50
	33600.0	-65.08	-71.56	-72.23	-62.97	-69.36		
	28435.0	-66.88	-63.48	-55.24	-65.44	-71.28		
18	1202.0	-77.25	-51.50	-66.11	-77.94	-80.67	-52.64	-46.98
	31360.0	-7.04	-27.68	-27.95	-2.37	-19.92		
	20846.0	0.45	9.67	56.04	1.48	-17.29		
19	1050.0	-80.60	-75.56	-59.12	-84.34	-86.38	-52.81	-37.93
	56000.0	-44.38	-62.83	-45.67	-55.92	-49.06		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
19	12833.6	-19.87	-47.81	-36.71	-40.35	-13.21		
19	1150.0	-74.02	54.71	11.48	-78.50	-85.79	51.84	197.95
	38000.0	18.76	43.41	66.34	10.60	-11.21		
	15460.8	22.52	26.01	56.58	15.20	6.24		
19	1200.0	-52.43	283.50	135.69	-60.40	-76.52	123.49	575.82
	29000.0	72.27	179.76	183.35	78.02	24.00		
	17826.5	10.34	55.01	121.02	15.57	-21.91		
20	1200.0	-8.37	-7.05	-3.00	-28.39	-60.29	-42.33	-6.09
	30000.0	-8.28	-22.09	-3.52	-16.23	-23.81		
	11937.0	-10.16	-24.48	-6.60	-14.58	-29.99		
20	1200.0	24.94	19.23	34.51	-10.49	-54.27	-54.69	41.48
	25000.0	25.03	-14.51	41.61	2.31	-13.67		
	43979.0	21.32	-18.84	35.33	5.45	-24.45		
20	1350.0	9.14	30.27	1.91	19.25	-27.69	-37.76	15.97
	17500.0	9.09	-7.25	13.25	16.49	-24.39		
	16694.0	7.48	-10.52	11.03	18.69	-30.02		
21	1000.0	-74.39	-73.30	-51.23	-77.93	-39.99	8.98	44.07
	80000.0	-46.03	-68.80	-51.47	-63.03	-50.85		
	4554.0	-17.48	-54.81	-11.73	-50.80	-8.35		
21	1100.0	-81.50	-29.15	23.30	-83.23	-89.97	244.60	724.36
	55000.0	-8.89	-16.70	39.39	-32.34	-41.51		
	5244.0	73.60	20.12	99.48	21.04	56.08		
21	1100.0	-75.67	-34.49	-0.76	-76.69	-84.69	165.90	334.10
	60000.0	-18.03	-24.16	9.69	-34.28	-42.10		
	2550.0	51.44	11.18	65.03	13.17	41.60		
21	1100.0	-72.58	-46.65	-28.86	-72.37	-80.23	69.51	110.60
	65000.0	-36.99	-40.21	-23.41	-45.62	-51.53		
	1501.0	8.70	-14.57	14.57	-12.95	3.54		
21	1100.0	-84.88	-78.22	-74.19	-84.03	-87.63	-48.70	-46.76
	70000.0	-76.28	-76.68	-73.01	-78.02	-80.30		
	1861.0	-63.07	-68.69	-61.72	-68.30	-64.79		
21	1100.0	-73.97	-62.50	-55.57	-72.50	-78.70		
	70000.0	-59.17	-59.86	-55.53	-62.16	-66.08		
	1081.0	-36.42	-46.10	-34.11	-45.43	-39.38		
21	1200.0	-83.22	39.25	91.30	-84.70	-92.17	167.26	971.66
	35000.0	7.16	39.04	111.13	-5.47	-34.76		
	7131.0	16.53	15.56	44.48	6.30	-10.90		
21	1200.0	-72.38	46.49	85.86	-73.76	-84.47	217.77	589.23
	40000.0	32.54	58.22	106.88	20.43	-10.04		
	2275.0	64.84	59.52	83.44	53.86	42.10		
21	1300.0	-33.55	543.30	522.60	-38.18	-71.32	191.25	1980.00
	20000.0	110.46	312.05	477.20	133.25	30.51		
	3538.0	29.26	81.22	95.50	43.32	-26.72		
21	1300.0	-40.60	221.90	215.20	-44.14	-67.08	170.52	687.30
	25000.0	96.86	179.68	215.27	111.32	49.22		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
21	1435.0	26.93	58.91	57.25	40.01	-7.47		
21	1350.0	-24.50	184.60	148.88	-28.52	-55.03	66.33	185.80
	20000.0	50.33	120.39	130.59	71.85	23.02		
	1232.0	-15.89	11.23	7.86	-4.88	-41.97		
22	1112.0	52.52	-28.00	102.36	-6.46	-5.89	67.83	460.11
	30000.0	75.40	11.40	143.31	-12.94	98.20		
	4258.0	77.62	28.61	163.59	8.66	114.33		
22	1112.0	1.12	-47.85	-21.68	-30.16	-20.27	34.14	172.99
	34000.0	8.93	-14.07	52.33	-37.57	29.83		
	2274.0	10.27	3.64	70.96	-24.52	39.34		
22	1140.0	-17.90	-46.98	-7.00	-34.54	-33.69		
	34000.0	-11.52	-23.31	10.10	-38.95	0.10		
	1077.0	-10.45	-9.17	22.51	-29.03	7.43		
22	1160.0	12.49	-22.02	32.91	-10.82	-25.44		
	30000.0	29.19	2.31	51.20	-10.73	38.12		
	1110.0	30.79	18.26	64.45	4.16	49.34		
22	1202.0	132.20	74.84	210.79	74.04	-11.41	84.04	754.80
	20000.0	196.04	66.59	184.40	90.04	158.96		
	3307.0	195.62	48.11	150.52	126.06	163.01		
22	1202.0	24.17	2.97	49.80	4.04	-33.67	55.67	196.70
	25000.0	52.06	14.94	58.65	14.48	49.75		
	1074.0	53.31	24.39	62.58	39.87	59.47		
22	1320.0	3.78	23.37	22.09	3.27	-57.19		
	15000.0	29.40	2.34	7.91	24.05	10.60		
	1505.0	27.48	-20.57	-12.86	31.49	3.64		
22	1425.0	-25.50	1.50	-20.76	-13.99	-63.70	-46.37	
	10000.0	-18.63	-27.87	-39.06	-6.48	-34.40		
	1690.0	-20.68	-57.43	-56.58	-5.85	-43.22		
22	1480.0	-45.50	-25.88	-46.03	-32.11	-67.96	-65.35	-18.79
	8000.0	-47.15	-53.64	-62.93	-35.13	-59.55		
	2237.0	-48.29	-74.39	-73.65	-34.54	-64.67		
22	1540.0	25.34	62.14	11.60	75.32	-3.29		
	6000.0	-0.57	-27.78	-40.38	29.53	-34.34		
	1258.0	-0.88	-55.14	-53.23	38.76	-36.40		
23	1000.0	-99.69	-99.82	-99.88	-99.67	-99.51		
	75000.0	-99.88	-99.84	-99.88	-99.86	-99.83		
	15600.0	-99.90	-99.88	-99.91	-99.89	-99.90		
23	1022.0	-75.06	-77.02	-40.27	-84.10	-87.61	51.43	124.77
	55000.0	-32.37	-58.88	-18.83	-60.44	-40.94		
	3680.0	-21.62	-42.54	2.52	-55.98	-11.77		
23	1112.0	-68.90	-44.45	18.80	-74.50	-87.09	56.36	166.25
	45000.0	21.46	-14.75	28.50	-3.78	-14.22		
	1020.0	42.75	16.15	46.73	11.24	40.44		
23	1112.0	-66.10	-36.71	55.80	-73.96	-87.89	95.69	314.89

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
23	43000.0	55.82	2.60	67.39	16.73	5.69		
	1579.0	80.16	34.69	81.63	33.61	70.97		
23	1112.0	-77.10	-54.08	41.48	-84.15	-93.55	55.24	395.37
	40000.0	32.65	-21.46	45.90	-8.90	-16.46		
	5367.0	47.98	-6.37	41.90	1.80	29.51		
23	1112.0	-77.01	-50.37	94.72	-85.82	-95.00	70.98	815.93
	37000.0	63.68	-14.11	84.50	2.60	-6.16		
	13140.0	73.78	-11.80	54.08	10.73	35.29		
23	1125.0	-64.11	-25.30	99.15	-73.20	-88.89		
	40000.0	91.50	23.33	104.65	43.17	24.03		
	2110.0	114.07	50.57	103.47	60.53	91.59		
23	1140.0	-69.18	-33.59	52.35	-75.09	-89.37		
	40000.0	50.04	5.27	55.95	22.32	0.32		
	1417.0	68.12	32.10	58.95	37.68	54.32		
23	1320.0	15.55	251.20	348.70	8.35	-67.42		
	20000.0	200.96	222.80	163.09	287.83	97.76		
	1212.0	127.85	24.47	19.35	212.96	21.41		
24	1200.0	23.98	-9.30	27.30	-4.80	8.39	175.40	467.00
	16500.0	40.44	23.30	69.31	11.81	51.80		
	12931.4	61.38	63.79	102.40	29.65	74.24		
24	1200.0	4226.00	1834.00	4148.00	2248.00	2595.00	3134.50	1×10^5
	9000.0	4810.00*	1081.00*	2775.00*	2725.00*	3991.50*		
	16730.4	3570.00*	728.90*	1147.00*	2147.00*	3175.00*		
25	1200.0	30.92	17.12	70.30	-2.73	-7.56	275.60	925.10
	16000.0	104.51	57.95	109.30	62.13	106.69		
	14584.7	109.23	67.49	124.80	65.29	116.45		
25	1350.0	52.80	88.49	86.71	43.67	0.37	23.95	121.30
	7000.0	95.96	48.92	38.18	103.16	68.44		
	13913.4	80.78	-11.74	-0.87	92.37	51.67		
26	1022.0	-58.21	-54.67	-34.75	-67.37	-65.18		
	27880.0	-47.66	-49.56	-36.94	-54.52	-52.09		
	18236.0	-46.47	-50.07	-37.12	-52.85	-50.24		
26	1022.0	-30.66	-10.70	57.19	-52.32	-50.50	58.37	232.50
	22190.0	-8.07	1.80	51.06	-27.09	-25.81		
	34610.0	-30.83	-31.27	7.55	-42.92	-42.70		
26	1112.0	-46.69	-12.74	3.46	-53.31	-60.93	20.06	89.34
	17780.0	-33.61	-3.46	0.63	-34.02	-46.06		
	16043.0	-56.26	-44.89	-35.86	-55.54	-63.84		
27	1022.0	-74.28	-67.03	-55.85	-79.77	-80.56		
	34560.0	-31.18	-49.74	-29.94	-45.23	-29.63		
	11484.0	-20.58	-31.59	-12.45	-35.55	-14.82		
27	1202.0	9.79	122.76	85.79	-1.67	-21.59	-1.73	93.45

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
27	14220.0	13.02	31.98	31.46	14.78	-0.59		
	13510.0	-13.12	-25.12	-14.67	-15.29	-27.14		
28	1112.0	10.45	45.27	53.84	-8.61	-5.93	-5.32	96.18
	17780.0	31.96	30.90	57.99	16.97	23.88		
	10495.0	10.77	8.06	29.53	-1.87	4.10		
28	1112.0	52.47	133.34	146.00	17.43	20.87	-18.97	252.34
	14370.0	35.84	49.26	105.03	11.54	16.94		
	26052.0	13.79	24.17	71.39	-7.22	-2.56		
28	1202.0	24.03	51.66	37.57	22.06	13.15	-32.66	77.28
	11380.0	-30.72	-12.67	-7.14	-33.45	-39.33		
	11941.0	-20.80	2.56	10.41	-24.04	-30.90		
29	1202.0	30.56	12.07	12.01	23.43	17.78	-32.21	14.20
	14220.0	46.16	89.09	121.19	31.96	24.34		
	15607.0	46.35	91.75	123.87	32.83	24.51		
				Ferritic Steels				
1	751.0	-30.24	-62.69	-43.07	-47.42	-13.76		
	28450.0	-41.20	-43.18	-34.86	-56.50	-26.24		
	2204.0	-40.80	-41.77	-34.27	-56.34	-26.06		
1	796.0	-39.55	-49.51	-31.75	-49.24	-43.26	-27.11	-34.35
	24180.0	-27.85	-34.32	-22.54	-40.40	-21.92		
	1762.5	-29.55	-32.80	-25.10	-41.15	-22.57		
1	796.0	-26.24	-37.62	-5.31	-42.21	-36.52	-5.85	-5.24
	22760.0	-1.04	-15.77	10.03	-23.39	6.68		
	2824.0	-3.35	-13.82	6.55	-24.33	5.77		
1	814.0	-43.61	-45.59	-23.20	-53.74	-54.45	-27.04	-16.93
	21340.0	-19.81	-30.78	-12.75	-34.40	-16.61		
	3161.0	-21.26	-29.62	-14.78	-35.05	-17.19		
1	796.0	-9.03	-20.91	55.12	-38.87	-35.37	13.58	69.44
	19910.0	45.43	2.26	77.47	-2.22	49.32		
	10079.0	44.08	3.40	75.75	-2.80	48.70		
1	814.0	-22.99	-22.99	36.69	-44.76	-47.79	-7.61	60.87
	18490.0	24.74	-10.58	48.20	-10.00	22.36		
	10990.0	25.09	-10.59	49.39	-10.02	22.33		
1	841.0	-21.03	-10.87	19.48	-33.55	-42.79		
	18490.0	19.37	2.05	28.61	2.38	17.91		
	2969.0	19.70	2.07	29.55	2.38	17.91		
1	886.0	11.85	41.89	58.30	3.59	-18.82	24.11	71.47
	15650.0	50.45	37.75	55.12	45.23	42.42		
	1532.0	54.30	35.22	61.02	46.98	43.59		
1	886.0	58.13	104.80	154.30	34.59	-0.14	6.54	191.52
	12800.0	66.43	13.63	90.36	49.57	29.69		
	8657.0	69.54	9.47	95.37	50.96	30.51		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
1	931.0	9.05	32.46	27.59	8.68	-13.09	-7.85	29.33
	12800.0	5.76	-4.53	8.11	9.77	-6.62		
	1651.0	7.67	-6.92	10.72	10.82	-6.01		
1	931.0	43.28	74.36	67.97	41.57	9.49	-15.19	71.24
	11380.0	8.51	-19.51	17.37	10.75	-17.42		
	4074.0	6.57	-21.18	14.30	9.78	-17.91		
2	931.0	-72.89	29.01	-49.50	-75.01	-81.00	105.63	185.41
	35840.0	111.06	115.95	97.65	119.34	102.15		
	5689.0	70.63	52.81	62.75	76.66	47.94		
2	841.0	-92.37	-68.10	-85.85	-92.82	-31.23	-8.68	17.75
	49280.0	-30.60	-37.32	-20.47	-40.86	-44.18		
	11570.0	-22.19	-28.55	-17.88	-31.51	-20.52		
2	751.0	-81.44	-80.36	-75.79	-83.15	-20.92	-32.31	-27.59
	62720.0	-47.34	-64.79	-45.42	-61.04	-41.79		
	5613.0	-43.90	-47.89	-31.57	-58.76	-31.45		
2	751.0	-88.44	-83.15	-81.38	-90.17	-26.53	-3.25	16.04
	60480.0	-34.52	-61.25	-27.66	-57.19	-30.32		
	13160.0	-27.78	-37.88	-5.61	-52.65	-8.94		
3	751.0	-53.87	-50.37	-46.05	-54.59	-62.62	21028.00	-23.30
	29120.0	-46.49	-48.48	-46.12	-47.18	-47.58		
	14654.0	-45.41	-47.65	-43.07	-46.19	-47.42		
3	706.0	-54.18	-52.78	-50.40	-54.51	-58.49		
	38080.0	-50.34	-51.78	-50.08	-51.05	-50.91		
	10082.0	-53.04	-53.14	-53.72	-54.47	-57.71		
3	706.0	-33.73	-33.44	-22.56	-37.50	-43.73	42389.00	48158.00
	35840.0	-24.25	-29.49	-21.47	-29.09	-24.67		
	13689.0	-28.01	-31.66	-26.82	-33.81	-25.87		
3	706.0	-0.01	-2.29	26.76	-10.70	-20.74	3×10^5	1×10^6
	33600.0	19.63	4.73	28.37	6.05	18.19		
	18634.0	15.45	2.52	23.52	0.71	16.69		
3	661.0	61.15	33.95	78.90	35.80	61.29	235.84	9×10^{10}
	42560.0	68.46	54.86	87.45	40.47	80.61		
	11727.0	62.55	46.48	66.48	34.79	78.78		
4	796.0	30.60	27.82	46.86	18.16	7.52	38.04	4.20
	24640.0	37.38	-9.54	5.70	27.78	20.86		
	17793.0	31.29	-20.41	-4.06	22.35	14.59		
4	751.0	-42.60	-49.39	-29.45	-53.63	-54.12	-0.94	115.58
	31360.0	-13.20	-33.20	-13.80	-26.86	-15.34		
	23180.0	-17.92	-37.70	-20.36	-30.16	-20.06		
4	706.0	-47.99	-60.40	-38.14	-60.30	-49.19		
	40320.0	-30.56	-29.38	-0.06	-46.60	-22.25		
	12290.0	-26.54	-19.11	11.49	-43.73	-16.81		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
5	931.0	-37.13	-65.00	-45.72	-52.99	-24.47		
	28450.0	-43.97	-61.85	-49.61	-58.23	-33.49		
	1079.3	-42.61	-60.38	-52.99	-57.05	-32.70		
5	931.0	-45.61	-70.39	-45.96	-63.18	-44.08	-9.29	16.70
	25600.0	-46.75	-67.26	-49.87	-64.10	-38.75		
	2924.0	-43.45	-64.19	-51.07	-61.32	-35.82		
5	931.0	-33.93	-64.46	-29.16	-57.60	-37.54	47.45	127.20
	24180.0	-32.53	-60.59	-34.07	-56.89	-24.23		
	3814.0	-28.10	-56.59	-35.57	-53.24	-20.28		
5	976.0	-21.23	-38.95	-7.54	-38.85	-37.02	257.79	645.40
	21340.0	-10.77	-34.49	-10.58	-31.16	-8.91		
	1445.0	-5.35	-28.19	-9.97	-25.33	-3.68		
5	976.0	-12.18	-33.18	18.28	-38.21	-41.05	418.19	1940.90
	18490.0	3.91	-29.23	16.82	-26.85	-1.38		
	3973.5	3.04	-28.72	6.84	-20.40	-1.86		
5	1021.0	1.59	2.96	34.45	-13.00	-33.75	342.25	590.40
	17070.0	24.79	6.38	35.70	7.37	15.67		
	1118.7	20.53	3.10	22.96	4.60	12.73		
5	1021.0	-22.31	-21.69	8.57	-36.01	-53.48	241.01	682.50
	15650.0	-4.99	-20.48	11.50	-20.93	-16.30		
	2825.0	-13.22	-28.40	-5.10	-27.93	-22.63		
5	1021.0	-5.06	-4.87	40.90	-25.10	-48.26	294.44	1376.20
	14220.0	13.79	-6.04	48.34	-8.68	-6.59		
	4778.0	-2.33	-22.08	19.82	-22.76	-18.62		
5	1066.0	-19.66	-1.32	8.28	-23.40	-51.34	66.38	291.60
	14220.0	-0.94	-1.79	12.73	-3.89	-12.83		
	1048.0	-12.82	-16.39	-6.12	-16.74	-22.32		
5	1111.0	-16.11	15.92	9.96	-12.73	-53.86	-44.98	30.87
	9960.0	-13.15	3.31	23.06	-6.71	-36.96		
	2618.0	-31.73	-25.00	6.62	-30.48	-49.97		
6	1111.0	1.57	211.85	103.19	-7.33	-29.44	121.38	586.30
	15680.0	118.95	212.33	170.42	138.98	83.18		
	11045.0	30.74	28.11	34.75	40.23	-7.84		
7	1112.0	118.08	192.59	250.49	91.02	69.00	599.56	3406.00
	17920.0	222.80	128.54	151.99	192.08	190.12		
	5845.0	176.72	82.91	106.01	153.40	150.53		
8	976.0	-88.09	-67.58	-81.49	-90.40	-90.32	-65.17	-41.24
	32930.0	-72.32	-68.95	-65.07	-76.47	-75.34		
	4108.0	-71.90	-69.00	-65.21	-75.51	-74.46		
8	1067.0	51.63	231.62	95.40	41.33	29.15	-18.33	195.94
	17690.0	-15.35	25.96	10.44	-18.72	-26.70		
	1664.0	-23.53	17.50	6.11	-29.93	-36.11		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
9	850.0	-41.61	-15.62	-23.84	-49.63	-49.64	-22.41	4.72
	15000.0	-1.92	-29.89	-22.22	-6.96	-6.97		
	15192.1	10.74	-19.44	-21.40	1.22	1.21		
9	850.0	-34.03	6.15	-7.01	-45.50	-45.50	-21.73	40.29
	13500.0	11.93	-32.79	-22.12	2.53	2.52		
	27224.3	42.80	-15.87	-19.23	22.86	22.85		
10	900.0	-52.84	-71.64	-38.65	-67.03	-64.02	172.70	182.60
	70000.0	-30.48	-57.30	-17.22	-58.90	-26.45		
	9878.0	8.40	-26.96	69.02	-45.15	26.41		
10	1000.0	-75.98	-51.19	-29.06	-77.67	-86.28	565.90	1076.90
	49000.0	3.89	-26.21	29.03	-22.91	-21.67		
	5108.0	121.68	40.46	135.83	51.35	118.09		
10	1000.0	-58.34	8.06	91.49	-64.57	-81.31	2652.30	11409.00
	43000.0	164.63	65.96	256.29	76.29	81.86		
	7390.0	415.90	168.15	413.67	222.60	376.10		
10	1000.0	-29.62	130.00	391.70	-44.96	-74.90	8540.70	99824.00
	38000.0	477.50	228.86	742.30	252.88	259.60		
	10447.0	851.70	295.25	741.84	459.60	696.75		
10	1100.0	8.08	523.80	706.40	1.57	-67.40	1293.10	23000.00
	22000.0	314.20	276.40	406.35	319.30	150.50		
	6637.0	144.40	7.14	15.01	160.80	49.21		
11	750.0	-91.55	-84.98	-84.90	-93.54	-93.52	1166.30	1830.00
	88000.0	35.95	-17.28	63.33	-10.90	27.25		
	2579.3	54.86	19.31	114.29	-1.55	72.75		
11	800.0	-96.89	-88.28	-93.98	-97.35	-97.77	733.70	1199.00
	80000.0	-21.61	-28.93	11.29	-38.46	-48.50		
	4340.9	21.55	-20.57	14.23	-6.31	9.17		
11	900.0	-82.34	23.23	-62.83	-84.70	-88.14	3197.50	8580.00
	60000.0	685.48	873.00	765.86	758.25	458.60		
	1213.3	431.71	330.10	246.47	517.10	317.80		
11	900.0	-66.14	344.66	-3.14	-73.10	-80.87	18377.00	96575.00
	55000.0	2904.00	3787.00	3370.00	3222.00	1841.60		
	2055.0	1230.01	694.80	552.16	1461.00	749.60		
11	900.0	-71.22	468.20	0.35	-78.37	-85.48	28262.00	3×10^5
	52000.0	3101.00	4198.00	3820.00	3438.00	1809.90		
	5165.5	1039.80	445.20	364.60	1232.00	531.60		
12	950.0	-53.51	-35.49	-12.49	-61.19	-70.99	-24.60	-5.42
	28000.0	-13.97	-31.39	-7.40	-28.77	-18.67		
	31737.0	-17.04	-29.53	-12.11	-27.40	-20.80		
12	1050.0	-43.90	62.26	51.01	45.01	72.61	-13.53	111.56
	17000.0	10.35	5.25	2.06	21.52	-6.98		
	29275.0	21.66	-3.36	23.76	16.09	-0.36		
12	1050.0	56.20	496.67	444.60	50.96	-39.28	52.10	749.70

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
12	14000.0	122.77	83.70	98.43	149.30	55.19		
	46347.0	147.83	65.10	151.37	137.16	67.48		
12	1100.0	6.69	193.17	129.39	12.84	-42.67	39.34	273.40
	14000.0	46.14	53.35	29.77	78.77	22.76		
	10728.6	63.21	38.27	60.42	69.28	33.23		
12	1100.0	68.49	457.00	304.70	82.99	-21.54	43.29	609.80
	12000.0	55.36	44.34	32.51	96.42	9.32		
	21243.8	67.64	32.08	58.72	89.28	15.79		
13	900.0	25.54	-14.11	98.49	-22.57	-16.45	11.53	122.60
	35000.0	70.93	-8.60	97.42	0.05	65.88		
	60370.0	68.60	1.20	85.15	12.59	58.97		
13	1000.0	3.51	17.07	51.32	-8.34	-37.18	-22.85	26.31
	25000.0	23.39	-20.01	-2.26	10.45	3.11		
	28614.9	23.73	-21.73	3.11	9.61	3.73		
13	1000.0	-0.32	12.74	45.72	-11.73	-39.51	-25.71	21.64
	25000.0	18.83	-22.96	-5.87	6.37	-0.70		
	29713.6	19.15	-24.63	-0.70	5.56	-0.11		
13	1050.0	102.32	144.06	140.67	105.08	37.12		
	20000.0	70.24	4.16	9.01	77.49	25.55		
	17359.8	70.65	-2.04	16.95	74.78	26.83		
13	1050.0	87.72	126.44	123.30	90.28	27.22		
	20000.0	57.95	-3.36	1.14	64.68	16.48		
	18710.8	58.33	-9.11	8.50	62.16	17.67		
13	1050.0	1133.13	1383.70	1313.10	1156.10	644.30	45.27	666.08
	15000.0	379.10	0.05	40.04	395.90	95.06		
	63870.0	364.38	7.08	30.41	527.80	80.36		
13	1100.0	685.60	806.60	533.40	843.40	582.70	95.64	190.74
	15000.0	218.80	18.66	28.38	282.00	69.99		
	10302.8	210.32	27.97	17.90	364.36	58.62		
13	1100.0	632.20	744.87	490.30	779.20	536.30	82.33	170.95
	15000.0	197.14	10.59	19.64	256.00	58.42		
	11055.2	189.20	19.26	9.88	337.40	47.83		
14	900.0	-74.33	-44.71	-53.80	-74.74	-81.63	-22.74	-10.16
	35000.0	-32.71	-38.62	-29.34	-36.70	-40.31		
	5102.0	-32.77	-36.75	-31.39	-38.72	-31.65		
14	1000.0	-49.68	56.71	7.36	-49.54	-70.21	5.14	97.16
	18000.0	10.17	13.78	11.08	21.14	-8.51		
	7438.0	10.32	-4.62	27.63	27.50	-20.99		
15	900.0	-90.70	-75.28	-68.43	-93.38	-94.66	-67.39	-44.85
	45000.0	-26.47	-44.48	-16.62	-45.76	-19.14		
	2850.0	-26.61	-52.11	-33.69	-46.43	-19.26		
15	1000.0	-88.98	-60.15	-69.06	-90.80	-92.93		
	35000.0	-44.31	-46.65	-44.67	-45.81	-48.04		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	1630.0	-43.91	-44.79	-35.30	-45.74	13.47		
15	1100.0	-63.73	33.27	-7.02	-69.59	-77.73	-8.12	65.30
	20000.0	15.28	26.78	8.66	27.87	12.26		
	2250.0	48.93	71.50	114.00	50.57	-48.08		
16	1000.0	-43.17	-26.14	-6.40	-58.08	-55.46	23.58	159.50
	40000.0	56.12	27.65	68.75	27.43	57.68		
	1687.0	57.36	39.42	71.98	30.32	60.80		
17	1000.0	-93.45	-93.45	-77.73	-96.16	-96.02	-55.38	-10.99
	60000.0	-62.46	-82.35	-53.19	-80.41	-70.61		
	3121.0	-31.44	-64.83	-18.37	-63.25	-34.90		
17	1100.0	-95.46	-86.76	-77.30	-96.50	-97.81	-38.27	103.03
	40000.0	-63.30	-75.83	-63.13	-69.79	-74.54		
	1922.0	-55.50	-71.49	-62.69	-60.32	-64.01		
17	1100.0	-69.78	18.17	199.02	-81.96	-89.48	194.03	8501.00
	30000.0	172.37	33.49	182.65	87.77	56.26		
	3819.0	122.40	-22.42	55.27	64.07	36.20		
17	1200.0	339.42	1412.40	1869.90	229.60	80.26	48.90	11794.00
	15000.0	188.26	87.06	154.75	185.55	54.33		
	1203.0	114.80	-39.02	11.56	102.90	2.72		
18	1000.0	-77.22	-58.70	-63.67	-77.83	-81.73	98.28	161.10
	50000.0	-32.94	-40.12	-23.75	-42.39	-41.76		
	7192.0	6.40	18.18	61.71	-12.91	22.28		
19	1000.0	-78.66	-70.66	-75.43	-80.23	-79.91	179.25	250.20
	75000.0	-14.57	-27.28	-16.64	-22.92	-16.60		
	1232.0	-12.62	-16.10	-2.15	-19.54	-10.73		
19	1000.0	-77.09	-59.02	-70.94	-79.65	-79.37	925.04	1697.00
	70000.0	74.67	32.09	60.37	50.22	65.03		
	2326.0	78.20	18.85	72.32	56.33	76.02		
19	1050.0	-44.82	19.43	-29.56	-49.05	-51.11	485.30	933.50
	55000.0	190.52	145.13	153.81	180.15	173.80		
	1652.0	182.50	7.68	78.16	167.13	155.70		
20	1200.0	-3.66	6.02	62.49	-40.55	-47.52	-56.67	1.47
	4000.0	37.78	10.93	56.29	13.54	24.04		
	1173.0	40.55	23.65	80.25	15.02	22.33		
20	1400.0	-78.58	-56.05	-67.97	-79.50	-88.68	-70.83	-49.15
	1650.0	-72.20	-46.62	-22.69	-64.69	-78.03		
	1316.0	-69.43	-14.86	21.51	-61.64	-80.84		
21	1090.0	42.33	176.73	289.61	45.41	-44.58		
	10000.0	99.03	93.73	164.65	115.32	15.44		
	2639.0	54.92	-0.43	40.39	77.38	-19.65		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
21	932.0	-77.20	-70.47	-40.53	-79.63	-87.28	-0.59	119.53
	35000.0	-34.23	-53.13	-23.87	-52.50	-47.61		
	1902.0	-16.82	-36.25	-3.78	-44.60	-12.48		
21	932.0	-84.70	-79.20	-44.20	-87.58	-93.16	-31.53	223.52
	30000.0	-43.00	-64.66	-27.91	-63.79	-58.49		
	7592.0	-32.67	-55.85	-19.20	-59.45	-34.80		
21	932.0	-80.05	-71.93	-8.31	-84.80	-92.33	16.42	622.72
	27000.0	-15.02	-51.96	15.74	-50.24	-42.56		
	11410.0	-5.70	-45.40	15.54	-46.44	-16.24		
21	780.0	13.42	-62.86	-42.37	-27.01	39.52		
	70000.0	-20.84	-47.42	-25.86	-53.05	14.24		
	1122.0	-26.31	-39.78	-3.84	-58.50	-0.72		
21	900.0	-77.52	-75.94	-48.55	-81.06	-86.57		253.74
	40000.0	-42.45	-61.80	-32.27	-61.72	-53.01		
	2572.0	-22.53	-45.50	-4.61	-54.40	-16.13		
21	1030.0	-56.00	-20.89	34.76	-57.73	-79.21		58.84
	20000.0	37.69	18.65	50.35	21.88	10.51		
	1084.0	15.60	3.08	13.12	11.52	-0.58		
22	900.0	-95.61	-87.19	-92.19	-96.34	-96.45	-78.27	-75.70
	55000.0	-61.27	-65.88	-57.17	-67.23	-67.70		
	1917.8	-61.17	-65.41	-56.82	-66.18	-63.15		
22	1000.0	-93.66	-64.06	-89.58	-94.30	-95.01	-65.29	-63.28
	40000.0	-39.79	-32.59	-39.73	-37.09	-51.59		
	1451.1	-39.82	-13.55	-17.58	-37.05	-50.31		
23	1000.0	-67.80	-61.24	-55.99	-72.85	-72.93	-66.82	-51.77
	14000.0	-56.35	-62.66	-54.40	-60.55	-57.03		
	22241.5	-56.66	-62.97	-55.05	-60.60	-57.14		
23	1100.0	-35.09	6.91	-10.35	-38.62	-48.24	-41.88	3.75
	7500.0	-28.48	8.02	-10.66	-27.44	-36.48		
	23168.7	-39.62	-9.41	-23.50	-38.75	-47.99		
25	1000.0	37.85	3.77	46.15	7.76	19.01	-15.90	27.86
	11000.0	32.35	16.02	39.85	13.21	34.37		
	13804.7	32.15	15.71	40.39	13.21	33.20		
25	1100.0	30.30	16.05	23.93	23.18	4.39	-8.76	17.31
	6700.0	26.88	18.12	31.99	27.75	13.84		
	11554.5	26.05	12.44	27.97	27.74	8.86		
26	1000.0	-31.10	-50.50	-32.50	-46.02	-34.25	-55.84	17.28
	10000.0	-39.21	-37.23	-22.71	-49.46	-35.05		
	19841.6	-45.76	-36.93	-24.40	-53.41	-40.56		
26	1100.0	42.28	30.91	29.91	42.12	37.63	-15.86	46.65
	5400.0	51.78	4.34	13.60	45.53	38.03		
	14547.6	19.47	-24.05	-16.27	14.89	12.02		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
28	1022.0	49.30	-49.03	-91.48	39.44	39.40	-81.98	-56.07
	17350.0	100.98	-89.58	-88.41	73.19	73.10		
	15800.0	98.40	-88.82	-87.80	74.22	74.16		
29	1022.0	-58.98	25.73	-38.19	-66.19	-66.19	-5.20	276.96
	11090.0	-35.60	43.29	-13.85	-44.05	-44.10		
	11368.0	-57.03	3.11	-41.48	-62.75	-62.75		
30	1022.0	-49.59	-17.58	-37.96	-54.86	-54.86	-23.32	134.74
	11090.0	-58.15	-25.03	-48.21	-62.19	-62.20		
	23515.0	-60.66	-21.77	-50.17	-64.70	-64.71		
31	932.0	-9.17	125.06	46.73	-28.63	-28.65	362.01	2117.80
	27590.0	238.46	199.42	205.15	181.51	181.41		
	14829.0	186.77	8.71	13.35	143.60	143.50		
31	932.0	149.29	742.57	374.60	80.39	80.33	968.01	18061.00
	22760.0	692.55	567.90	584.78	520.21	511.98		
	22795.0	433.39	21.49	29.10	311.70	311.50		
32	932.0	-50.89	8.60	-25.07	-60.46	-60.46	396.58	1246.50
	43670.0	41.43	36.36	36.96	24.73	24.72		
	20943.0	20.78	-22.16	-22.65	5.34	5.33		
				Aluminum Alloys				
1	94.0	-96.67	-96.44	-21.29	-96.78	-97.26	25.36	38.65
	63000.0	-88.37	-93.74	55.69	-91.86	-93.52		
	553.3	-73.41	-88.33	170.80	-87.42	-74.21		
1	94.0	-97.91	-96.86	126.23	-98.08	-98.40	273.30	349.90
	62000.0	-88.26	-93.54	416.90	-93.07	-95.14		
	1044.5	-57.40	-85.60	965.50	-84.42	-63.86		
1	211.0	-97.34	-67.99	89.56	-98.12	-98.61	1731.20	2972.30
	48000.0	-75.32	-32.67	83.99	-82.60	-94.81		
	867.2	90.99	26.59	106.20	27.19	0.05		
1	300.0	-79.15	599.48	683.67	-83.60	-89.03	1763.70	5373.00
	30000.0	277.35	933.08	569.69	258.00	-22.41		
	651.8	122.04	210.50	179.90	171.90	-30.70		
1	300.0	-75.37	1328.70	1570.00	-81.09	-88.54	3490.50	17059.00
	28000.0	334.21	1496.50	940.58	316.80	-23.47		
	942.5	122.41	221.70	280.60	166.50	-48.87		
2	300.0	-71.86	-78.96	-49.86	-78.79	-78.69	4.60	20.88
	38000.0	-53.80	-34.82	17.17	-67.08	-39.19		
	1168.0	-56.81	-21.26	-4.35	-69.46	-38.93		
2	300.0	-35.62	-46.51	87.38	-58.63	-61.16	309.80	534.80
	35000.0	55.05	123.30	415.22	-6.08	118.22		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
2	1092.0	64.77	162.95	353.20	-1.40	138.10		
2	300.0	-57.86	-57.33	207.76	-79.92	-83.40	461.38	1872.80
	30000.0	86.74	152.20	823.70	-12.60	182.46		
	6937.0	199.57	153.27	1005.00	27.30	297.23		
3	211.0	-77.89	101.16	-29.22	-82.95	-79.49	667.10	736.00
	54000.0	-48.15	372.70	11.78	-65.38	-52.15		
	570.3	-3.83	-32.10	115.70	-41.09	5.32		
3	211.0	-67.29	1765.20	262.56	-77.29	-72.98	17250.00	23606.00
	52000.0	66.11	8903.90*	506.34	-10.31	26.53		
	668.1	413.50	117.43	1256.70	149.40	426.12		
3	300.0	-71.07	347.50	645.98	-75.65	-81.34	35942.00	1×10^5
	38000.0	318.90	1145.70	546.90	231.52	157.37		
	657.6	365.67	107.95	125.40	325.30	260.52		
4	94.0	-92.25	-97.78	-74.12	-92.82	-92.71	-6.43	-12.05
	64000.0	-84.08	-94.80	-25.73	-89.59	-82.18		
	544.6	-86.86	-91.62	22.91	-92.92	-78.27		
4	211.0	-97.69	-82.50	-79.85	-97.51	-98.34	360.60	390.60
	54000.0	-81.58	-75.20	-40.46	-85.39	-95.23		
	582.7	-46.73	-61.40	-25.50	-62.63	-52.59		
4	300.0	-85.30	138.90	148.40	-87.42	-92.30	707.10	1107.70
	40000.0	395.30	424.10	367.00	361.80	7.29		
	508.4	168.02	158.67	105.80	198.80	20.49		
4	300.0	-82.53	348.60	443.90	-85.50	-92.20	1974.00	4283.00
	38000.0	630.70	741.50	703.00	575.10	25.04		
	864.8	221.74	173.89	176.50	250.40	-2.86		
5	200.0	-45.60	-44.83	87.65	-63.90	-61.03	16.20	52.37
	24500.0	19.92	-17.86	115.37	-19.22	17.87		
	1443.7	18.89	1.39	84.83	-17.89	32.45		
5	300.0	-50.69	47.43	12.64	-58.77	-73.57	-6.99	55.13
	13000.0	32.40	30.96	-1.91	43.27	11.41		
	1376.0	34.79	-18.39	81.50	39.36	-3.81		
6	300.0	-60.30	39.32	-52.24	-65.47	-79.71	-31.24	21.64
	13500.0	-20.49	-1.60	-50.08	5.26	-32.68		
	1268.0	-7.03	-51.73	70.98	10.16	-44.00		
7	200.0	30.00	108.90	272.30	-23.19	-27.28	97.79	249.40
	20000.0	162.47	101.76	277.23	105.90	122.50		
	1475.5	157.02	70.60	302.50	101.67	116.10		
7	300.0	-61.34	36.58	-57.22	-64.37	-79.71	-38.30	-1.66
	13000.0	-28.42	-4.20	-57.54	-1.46	-39.85		
	1111.9	-34.90	-48.00	-51.10	-16.38	-56.43		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
8	212.0	-96.70	-71.09	-37.40	-96.50	-97.13	3.65	13.93
	36000.0	-59.02	-43.31	-46.42	-67.90	-91.31		
	1098.7	113.68	-35.09	-33.70	-32.22	-30.96		
9	211.0	-97.04	-89.43	-87.60	-97.53	-97.84	167.60	264.30
	52000.0	-91.35	-85.31	-71.81	-91.14	-95.82		
	759.5	-46.90	-65.23	-40.90	-62.49	-72.00		
9	211.0	-97.37	-89.80	-86.70	-96.98	-98.15	269.80	454.10
	51000.0	-91.15	-85.28	-67.80	-91.20	-95.96		
	991.8	-39.97	-62.23	-30.90	-59.37	-68.91		
9	300.0	-42.67	458.00	622.60	-48.29	-74.51	2948.00	57479.00
	20000.0	84.66	312.80	671.20	101.97	-28.58		
	1451.6	33.16	16.37	117.70	58.12	-57.56		
10	482.0	-32.59	-15.40	-42.90	-41.14	-70.28	-35.39	34.13
	2840.0	-28.84	-29.50	-40.95	-22.27	-41.35		
	540.0	-38.54	-56.32	-40.95	-36.75	-53.05		
10	572.0	24.11	42.23	-32.08	71.94	33.19	-21.65	-40.50
	1780.0	-24.20	-40.50	-30.84	-14.53	-52.86		
	722.0	-22.66	-60.68	-25.88	-15.58	-52.89		
11	212.0	-48.30	-73.48	28.88	-71.66	-56.86	-33.52	-19.40
	20000.0	-39.70	-61.49	12.21	-67.55	-22.00		
	1560.0	-17.80	-29.46	36.76	-56.57	16.36		
11	212.0	-67.45	-87.55	70.95	-87.90	-83.08	-60.25	-9.87
	17000.0	-54.77	-79.44	44.07	-82.69	-46.54		
	11010.0	-33.90	-56.47	68.79	-74.12	-6.80		
11	300.0	-63.57	-69.01	-31.14	-76.67	-89.54	-29.57	45.88
	11000.0	-41.45	-57.50	-34.25	-56.70	-55.70		
	3800.0	-31.79	-33.76	-42.20	-41.89	-32.48		
11	400.0	88.45	110.57	72.65	44.86	-60.58	-40.23	341.25
	4000.0	99.04	50.60	131.72	92.15	-8.83		
	12850.0	19.65	-49.07	68.56	14.00	-49.77		
11	500.0	23.17	68.00	-34.63	59.01	-15.77		
	3000.0	-6.31	10.65	-20.89	28.66	-37.32		
	1812.0	-18.90	-47.44	-17.30	-0.87	-53.26		
12	400.0	396.11	1081.00	227.80	509.60	-68.86	-80.71	48.57
	6000.0	445.30	482.00	104.30	707.23	87.39		
	1150.0	90.12	-1.88	-39.59	164.57	-42.07		
13	212.0	-92.62	-91.14	2.31	-95.80	-96.56		
	5600.0	-40.36	-85.45	-28.97	-73.41	-49.52		
	1530.0	-22.97	-77.68	-75.26	-66.03	29.48		
13	302.0	-96.90	-83.65	-70.58	-97.69	-98.80		
	4480.0	-68.23	-75.33	-66.43	-74.00	-83.58		
	2086.0	-62.62	-71.24	-74.04	-66.83	-60.33		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
13	392.0	-84.40	7.57	-19.47	-88.33	-95.29		
	2910.0	-21.46	7.09	30.70	-7.86	-55.43		
	5168.0	-52.25	-24.10	212.56	-45.96	-78.33		
13	392.0	-69.73	161.21	95.32	-78.70	92.76	182.24	517.50
	2690.0	26.63	115.10	290.90	42.23	-42.97		
	8372.0	-18.52	36.58	1467.00	-13.28	-69.08		
14	212.0	-92.31	-95.50	-91.31	-92.25	-93.30		
	21500.0	-91.15	-94.60	-91.21	-92.20	-90.75		
	1031.0	-88.30	-93.17	-84.10	-91.62	-87.04		
14	212.0	-98.11	-98.41	-93.98	-98.30	-98.66	2617.00	3624.00
	20380.0	-96.06	-97.85	-92.24	-97.19	-96.74		
	7168.0	-88.75	-95.45	-64.80	-94.53	-89.67		
14	302.0	-95.01	-76.85	-54.21	-95.33	-97.15	4×10^5	2×10^6
	14780.0	-73.14	-69.68	-18.91	-78.78	-85.80		
	1990.0	29.50	-13.62	137.90	-16.45	-10.52		
14	302.0	-96.07	-71.20	-19.99	-96.60	-98.25	7×10^6	1×10^8
	13440.0	-67.15	-61.95	49.86	-76.37	-85.86		
	5833.0	42.30	-7.37	237.60	-14.50	-13.57		
14	392.0	-78.71	62.38	57.73	-80.40	-90.86	928.70	4173.00
	7840.0	-45.49	17.91	46.90	-40.76	-71.24		
	4290.0	-65.80	-40.60	6.10	-61.88	-82.44		
14	392.0	-81.18	76.36	71.94	-82.66	-92.91	1056.00	8457.00
	7260.0	-62.67	4.76	41.11	-58.07	-82.57		
	8902.0	-70.53	-43.09	50.55	-68.23	-87.15		
15	212.0	-75.83	-70.56	67.37	-84.90	-87.51	8.58	40.73
	21500.0	-4.96	-49.64	85.17	-45.94	-16.94		
	2600.0	13.36	-25.75	91.16	-34.80	24.00		
15	302.0	-87.08	-29.02	28.25	-90.12	-95.24	30.50	167.80
	14560.0	-5.84	-2.04	-0.53	-11.74	-41.25		
	3348.0	-24.63	-28.75	-21.53	-21.13	-40.60		
15	302.0	-88.27	-15.73	74.40	-91.96	-96.58	35.18	318.70
	13440.0	7.48	9.88	25.18	-2.98	-38.05		
	7942.0	-31.01	-40.99	-11.30	-29.95	-52.18		
15	392.0	91.49	1026.00	379.10	52.74	-39.67	95.36	474.90
	7840.0	237.70	458.50	232.61	369.74	113.68		
	1202.0	50.16	21.36	146.60	94.08	-27.06		
15	392.0	49.18	1098.00	298.90	12.68	-65.01	-3.49	484.10
	6720.0	47.03	185.10	124.50	103.13	-33.87		
	5790.0	-7.98	-35.53	91.42	17.44	-62.09		
16	212.0	-95.42	-93.82	-70.09	-97.30	-97.30	-66.91	-62.20
	36960.0	-74.11	-89.78	-69.45	-83.60	-79.41		
	1173.0	-71.16	-95.50	-48.10	-83.95	-68.00		
16	212.0	-97.11	-94.18	-53.40	-97.58	-98.54	-50.27	-34.40

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
16	35620.0	-67.45	-89.05	-51.52	-82.30	-78.49		
	2563.0	-62.03	-96.23	-12.94	-81.50	-58.00		
16	212.0	-98.28	-93.53	14.98	-98.73	-99.33	6.24	92.30
	33600.0	-45.10	-85.40	22.72	-76.36	-72.89		
	7202.0	-32.03	-96.74	120.20	-73.90	-29.79		
16	302.0	-94.34	90.25	471.15	-95.37	-97.73	2085.00	9760.00
	22400.0	248.50	230.70	536.10	168.30	4.96		
	1726.0	227.90	133.20	259.30	180.10	151.65		
16	302.0	-93.69	403.80	2081.50	-95.37	-98.21	5119.00	54964.00
	20160.0	941.70	807.80	2294.00	636.60	142.55		
	3486.0	511.30	171.20	689.30	414.80	297.18		
16	392.0	-83.72	344.30	224.86	-86.36	-92.49		
	13440.0	251.02	394.50	228.50	354.60	86.96		
	1030.0	-5.32	-35.50	-15.23	-43.90	-39.54		
16	392.0	-72.11	1944.90	1295.70	-77.60	-91.83	110.00	436.00
	11200.0	746.00	1524.00	1222.00	1061.90	208.57		
	2114.0	71.18	-39.14	120.91	163.93	-24.98		
16	392.0	-40.98	14409.00	9003.30	-54.99	-90.07	376.10	4191.40
	8960.0	1493.50*	5527.00*	7693.00*	2124.00*	224.78*		
	4563.0	338.30	-53.43	917.70	517.20	32.08		
17	90.0	-95.54	-94.40	-60.14	-95.33	-96.27	-30.69	-33.01
	18870.0	-87.99	-93.08	-48.64	-89.72	-93.27		
	802.5	-83.32	-91.26	-23.92	-90.61	-85.18		
17	300.0	-98.05	-47.60	-6.31	-98.19	-98.55	136.58	226.60
	11500.0	-26.59	85.23	34.45	-22.95	-90.72		
	946.5	-30.07	1.23	-45.81	-12.97	-71.20		
18	90.0	5812.00	40.33	2×10^6	703.50	12209.00		
	39500.0	3557.00*	2012.00*	1×10^7*	416.87*	26477.90*		
	626.0	837.60*	26279.00*	1×10^6*	97.80	7108.00*		
18	212.0	-42.41	-52.07	15.48	-55.10	-51.61	27.57	42.33
	26500.0	-17.41	-32.56	31.74	-39.21	-9.06		
	637.6	0.59	-3.96	58.90	-28.22	12.36		
18	300.0	-14.54	81.55	112.70	-30.12	-55.71	79.43	271.88
	13000.0	94.98	80.46	96.16	82.25	85.67		
	874.6	13.38	-9.70	18.29	12.34	3.28		
19	211.0	-96.52	-95.45	-95.22	-95.50	-96.82	764.70	549.50
	52000.0	-95.92	-95.46	-95.97	-95.56	-96.96		
	759.5	-86.51	-88.13	-55.68	-89.10	-93.52		
19	211.0	-97.02	-96.02	-95.38	-96.19	-97.42	1129.30	933.90
	51000.0	-96.24	-96.00	-96.10	-96.08	-97.32		
	991.8	-85.90	-88.25	-48.93	-89.22	-93.51		
19	300.0	-79.55	-36.45	78.21	-79.01	-94.86	2×10^5	2×10^7
	20000.0	-25.35	-37.03	23.16	-45.52	-67.75		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
19	1451.8	108.35	92.91	167.50	81.28	-9.05		
20	150.0	-97.15	-96.85	-35.12	-98.39	-98.37		
	8960.0	-73.48	-89.90	94.96	-89.60	-85.56		
	9000.0	-73.89	-89.11	-36.06	-89.65	-68.53		
20	300.0	-96.72	-83.18	-81.20	-97.28	-98.66	-40.81	-20.16
	6160.0	-50.39	-53.93	-68.64	-48.99	-80.01		
	4220.0	-50.48	-52.32	14.09	-49.10	-71.57		
20	300.0	-93.06	-48.85	-26.08	-95.05	-97.89	140.00	471.98
	5600.0	50.25	22.48	5.30	39.88	-53.62		
	11380.0	50.68	23.65	780.00	39.84	-43.55		
21	150.0	-91.83	-90.27	211.14	-95.30	-95.50	-23.79	0.57
	13440.0	-63.67	-84.12	207.70	-84.20	-75.39		
	7200.0	-44.19	-76.49	70.60	-78.90	-33.50		
21	300.0	-74.28	83.93	164.83	-81.08	-91.42	87.90	366.41
	7840.0	21.69	24.77	81.75	13.85	-37.04		
	6500.0	-3.45	-24.59	242.40	-4.28	-58.10		
22	150.0	-83.92	-89.30	50.72	-89.50	-91.34		
	22400.0	-69.37	-85.45	127.17	-86.22	-67.70		
	3500.0	-48.40	-47.72	412.30	-78.40	-16.41		
22	300.0	-77.62	-49.30	40.79	-82.80	-94.36	34.58	175.80
	11200.0	-17.75	-45.50	1.49	-42.51	-41.25		
	3890.0	-16.42	-27.11	-27.56	-35.06	-18.78		
22	300.0	-68.51	-19.90	188.40	-78.90	-94.57	106.87	630.60
	10080.0	30.30	-25.50	74.16	-18.62	-21.18		
	7850.0	22.16	-33.76	-2.92	-14.55	-0.99		
22	400.0	33.25	121.10	29.38	24.29	-51.43	-41.02	4.80
	6720.0	27.14	25.80	-3.15	42.44	-21.68		
	1230.0	31.63	-53.80	-35.83	45.96	-19.21		
23	150.0	-72.55	-74.53	715.80	-82.19	-31.52	108.37	193.50
	26880.0	0.47	-60.67	915.30	-61.55	-16.86		
	3800.0	45.50	-5.86	1120.50	52.65	183.94		
23	300.0	-85.80	-61.89	8.19	-86.47	-41.14	19.79	65.27
	15680.0	-29.67	-47.33	-12.47	-46.03	-55.32		
	1796.0	-15.86	-15.09	-11.25	-36.72	2.48		
23	300.0	-88.94	-59.83	109.50	-90.83	-48.75	68.05	351.77
	13440.0	-5.75	-42.58	49.92	-40.50	-49.84		
	8600.0	6.36	-19.70	46.30	-32.75	13.43		
23	300.0	-88.89	-52.15	251.80	-91.49	-51.30	108.10	821.72
	12320.0	19.60	-35.07	124.90	-31.73	-45.04		
	18000.0	30.65	-22.85	115.42	-24.56	19.99		
23	400.0	-58.28	27.20	37.80	-59.72	-31.22	32.93	208.10
	7840.0	0.46	-0.46	-0.94	6.35	-43.58		
	3900.0	-4.02	-42.61	-3.85	3.27	-42.31		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
23	400.0	-70.20	21.82	28.69	-70.83	-39.38	-20.27	288.40
	6720.0	-39.68	-42.84	-28.79	-34.19	-79.91		
	17480.0	-28.70	-67.15	-25.28	-25.30	-65.13		
24	90.0	-81.62	-68.60	163.96	-90.21	-93.51	29.15	46.15
	16500.0	60.56	1.36	146.90	-11.63	30.64		
	887.7	51.88	-19.15	282.90	-10.53	53.32		
24	300.0	-86.64	-17.50	-84.10	-84.49	-94.38		
	11000.0	-27.20	75.04	148.12	46.04	-15.14		
	520.1	84.50	446.40	255.50	292.50	-39.28		
25	90.0	-41.92	-51.84	22.50	-45.93	-44.69		
	39000.0	-26.10	-43.79	-5.53	-37.99	-34.50		
	633.6	-25.12	-29.75	186.10	-41.04	-14.74		
25	212.0	-87.39	-73.36	-79.60	-85.59	-88.90		
	31500.0	-79.50	-73.36	-76.94	-78.60	-87.37		
	670.7	-71.40	-79.92	-75.10	-71.99	-71.69		
25	300.0	-77.56	-14.75	-28.93	-77.06	-83.16	4433.60	7352.50
	22000.0	-14.22	0.47	63.97	-18.45	-64.56		
	566.3	-14.30	-7.11	-18.80	-9.95	-7.30		
26	90.0	2328.00	-55.28	2×10^5	162.05	10821.00		
	31500.0	850.20*	4647.00*	2×10^8*	19.65	40972.70*		
	704.0	2×10^4*	3695.00*	3×10^9*	1729.00	70082.40*		
26	212.0	-87.36	-89.78	-69.67	-90.57	-89.21	59.35	70.29
	27000.0	-75.37	-78.90	-48.62	-82.99	-71.32		
	899.0	-77.98	-80.54	-57.61	-84.40	-72.31		
26	300.0	-88.52	-78.05	-66.14	-89.60	-93.68	45.20	55.47
	22500.0	-49.66	-57.89	-56.29	-49.52	-56.16		
	523.8	-47.79	-57.29	-48.93	-50.12	-57.50		
				Nickel Alloys				
1	1400.0	-31.70	-27.11	9.99	-46.18	-48.04	-24.66	4.87
	61000.0	19.21	-16.92	9.25	-7.87	17.19		
	2279.8	40.27	-1.95	21.87	9.04	47.99		
1	1400.0	-23.07	-0.35	73.99	-44.50	-49.32	-10.82	70.82
	55000.0	69.50	14.04	72.27	20.79	57.18		
	4063.2	96.57	31.46	85.77	42.49	98.95		
1	1500.0	-33.44	33.49	64.88	-40.15	-55.17	38.65	120.19
	45000.0	40.25	40.95	63.03	29.95	22.38		
	1228.3	52.34	47.66	62.50	45.63	44.40		
1	1500.0	-8.46	125.38	206.60	-23.50	-46.92	70.94	324.70
	39000.0	126.70	131.02	203.00	99.90	86.98		
	2227.4	117.26	113.90	170.50	98.96	91.89		
1	1500.0	101.07	587.88	992.30	49.18	-8.30	153.37	1505.20

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
1	31000.0	464.70	530.39	982.20	358.70	309.77		
	4393.4	335.70	362.50	709.20	268.90	226.42		
1	1600.0	-0.20	194.04	214.40	-9.63	-43.61	33.57	306.13
	24500.0	85.84	154.95	214.00	89.90	47.23		
	2899.7	31.40	74.11	133.72	35.64	0.08		
1	1600.0	114.25	705.90	719.54	84.10	0.39	43.60	1116.10
	19000.0	218.09	460.80	797.90	215.01	110.00		
	6331.0	125.74	253.20	585.00	122.60	42.40		
1	1700.0	6.82	77.23	53.79	7.26	-21.36	-25.08	33.80
	17500.0	2.76	45.78	55.24	13.16	-13.03		
	1768.7	-17.64	12.06	36.07	-11.52	-34.58		
1	1700.0	97.91	258.10	195.87	101.60	33.76	-13.59	165.70
	14500.0	38.13	147.70	201.30	52.38	-0.05		
	2838.7	42.57	119.80	216.03	54.48	4.57		
2	1200.0	-66.80	-58.10	-27.82	-74.90	-78.51	44.16	158.90
	95000.0	-11.97	-41.47	-7.95	-38.70	-14.63		
	3900.0	4.65	-14.24	28.63	-27.25	16.85		
2	1200.0	-69.15	-52.18	-0.94	-78.80	-83.27	102.50	464.40
	86000.0	18.50	-28.39	32.68	-26.05	7.63		
	7589.9	41.31	2.75	75.89	-10.74	54.04		
2	1300.0	-72.75	-31.80	0.53	-77.26	-85.34	75.70	311.60
	65000.0	6.78	-8.34	22.85	-11.90	-13.51		
	3879.8	15.31	-2.42	15.68	-0.59	11.19		
2	1300.0	-72.89	-19.45	31.06	-78.70	-87.32	101.20	623.70
	59000.0	31.14	8.66	58.58	2.95	1.46		
	6720.4	29.57	0.64	26.63	7.67	19.51		
2	1400.0	-62.67	-9.67	-0.15	-64.63	-75.86	27.62	74.12
	52000.0	6.04	10.81	13.40	6.34	-7.89		
	1029.4	-1.37	-0.10	-7.63	3.98	-5.80		
2	1400.0	-48.83	75.06	112.00	-55.08	-74.80	90.80	442.76
	41000.0	87.82	97.86	120.10	83.57	48.59		
	2657.8	39.92	18.18	18.23	44.53	17.13		
2	1400.0	-53.26	85.72	133.95	-60.30	-79.54	65.03	607.00
	37000.0	80.81	93.20	126.00	74.26	34.66		
	5022.2	-1.37	-5.54	-0.46	27.19	-3.18		
2	1500.0	2.14	216.60	199.20	-3.79	-48.97	12.96	235.98
	23000.0	60.64	111.26	122.10	80.74	14.67		
	3016.6	39.92	-13.13	-10.74	38.67	-13.50		
2	1500.0	-0.08	294.60	266.12	-6.90	-58.73	-33.42	326.44
	18500.0	12.72	68.93	90.50	27.22	-37.12		
	9251.7	21.53	-27.92	-20.76	34.91	-24.95		
2	1600.0	-3.13	17.13	-3.03	0.46	-26.30	-63.63	-56.14
	17000.0	-49.07	-34.67	-36.16	-43.24	-61.86		
	1770.8	-29.80	-38.03	-39.91	-22.93	-40.07		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
3	1000.0	-59.35	-52.97	-30.19	-66.19	-66.87	17.96	33.66
	134000.0	0.79	-16.63	16.45	-13.25	10.14		
	1731.0	13.02	-4.79	14.88	-11.25	24.34		
3	1000.0	-79.64	-68.24	-37.23	-85.19	-86.44	41.54	112.85
	124000.0	22.88	-18.18	42.70	-16.15	11.63		
	8473.3	27.33	-8.74	44.77	-13.39	33.59		
3	1000.0	-85.78	-73.15	-36.25	-90.42	-91.68	61.20	211.53
	118000.0	35.14	-16.69	67.39	-15.81	14.42		
	21524.0	38.66	-11.54	67.92	-13.50	36.72		
3	1100.0	-76.70	-47.04	-30.46	-78.95	-84.40	23.78	60.81
	105000.0	17.21	15.00	25.46	11.42	-3.15		
	2327.6	17.62	8.06	23.39	12.70	6.57		
3	1100.0	-83.08	-46.03	-13.91	-86.17	-90.77	54.80	216.60
	94000.0	48.78	39.40	68.98	32.62	12.96		
	10606.2	39.92	11.52	60.56	27.37	7.53		
3	1100.0	-85.75	-40.40	11.19	-89.27	-93.42	76.45	493.50
	86000.0	67.22	52.95	104.43	41.07	15.06		
	32990.0	49.57	3.65	87.96	30.03	-2.74		
3	1200.0	-76.32	-45.70	-40.14	-77.78	-83.72	-31.41	-9.33
	78000.0	-19.68	-9.84	-19.89	-11.69	-28.46		
	3131.5	-28.33	-30.59	-24.05	-19.53	-44.63		
3	1200.0	-58.80	27.10	48.19	-62.69	-76.01	20.43	163.24
	68000.0	30.62	54.72	43.70	42.11	-1.42		
	7263.2	16.74	1.35	32.91	29.26	-23.13		
3	1200.0	-36.42	139.40	178.29	-43.56	-66.24	72.51	440.20
	63000.0	69.23	107.89	102.40	80.89	12.27		
	10232.3	57.43	28.64	86.05	69.98	-2.15		
4	1300.0	4.09	-15.31	20.96	-17.48	-5.53	-10.70	13.48
	67000.0	28.63	3.84	30.66	1.18	35.26		
	1209.0	23.05	1.00	21.77	-1.94	34.89		
4	1300.0	21.01	-1.55	40.61	-4.07	9.82	3.81	31.92
	67000.0	49.53	20.72	51.89	17.62	57.24		
	1040.0	43.05	17.42	41.56	14.00	56.81		
4	1300.0	18.10	-1.77	55.55	-12.58	-1.66	-6.59	41.29
	62000.0	61.37	21.65	69.46	19.40	65.50		
	1904.0	54.15	18.33	57.95	15.50	65.02		
4	1300.0	33.29	10.86	75.55	-1.33	10.99	5.42	59.46
	62000.0	82.13	37.30	91.26	34.76	86.79		
	1687.0	73.98	33.55	78.26	30.35	86.25		
4	1450.0	-29.46	-3.29	5.43	-33.60	-49.20	-18.70	6.05
	38000.0	1.97	-1.03	7.06	1.47	-5.57		
	1136.0	5.08	0.59	13.18	3.35	-5.43		
4	1450.0	-24.61	3.35	12.67	-29.04	-45.71	-13.13	13.34
	38000.0	8.97	5.77	14.42	8.44	0.91		
	1063.0	12.30	7.50	20.95	10.45	1.06		
4	1450.0	-19.66	13.08	29.83	-27.47	-46.26	-31.84	30.21

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
4	33000.0	12.22	2.63	25.89	7.75	-2.70		
	2639.0	18.04	5.92	37.27	11.44	-2.43		
4	1450.0	-13.29	22.05	40.13	-21.72	-41.99	-26.44	40.55
	33000.0	21.13	10.77	35.88	16.30	5.02		
	2445.0	27.40	14.33	48.16	20.28	5.31		
6	1500.0	-39.03	-32.64	-23.51	-47.33	-47.66	-19.25	3.88
	40000.0	-13.01	-18.58	-10.51	-20.26	-11.02		
	1290.0	-12.84	-15.51	-9.94	-19.80	-9.93		
6	1650.0	42.54	197.50	135.55	32.90	0.60	84.94	256.64
	17000.0	123.96	128.80	114.76	141.90	104.31		
	1114.0	120.49	89.31	106.40	132.38	87.49		
7	1350.0	-18.34	74.09	409.33	-54.63	-67.18	22.84	2081.00
	20000.0	265.16	133.20	571.20	87.45	156.52		
	20045.0	278.70	130.20	506.70	106.30	196.43		
7	1350.0	-49.94	-21.22	78.10	-67.73	-74.03	-9.88	386.10
	25000.0	75.19	10.23	133.70	3.03	41.19		
	10400.0	125.60	38.60	169.70	37.95	101.79		
7	1350.0	-71.86	-65.45	-36.72	-79.52	-82.02	-50.84	19.50
	30000.0	-27.69	-53.30	-21.16	-52.04	-35.64		
	7257.0	3.57	-33.59	4.58	-29.88	0.88		
7	1350.0	-68.94	-69.08	-52.61	-74.95	-76.32	-54.43	-34.45
	35000.0	-43.04	-61.40	-45.37	-57.91	-45.36		
	2980.0	-17.20	-43.56	-23.95	-38.57	-14.96		
7	1500.0	172.78	1480.60	2384.30	99.09	-16.84	36.06	26408.00
	7000.0	265.98	640.10	1587.60	216.87	89.66		
	13750.0	136.28	288.80	1054.30	104.10	20.09		
7	1500.0	11.90	369.30	553.40	-9.97	-55.42	53.31	4118.00
	10000.0	170.58	291.70	532.30	143.54	80.30		
	6180.0	56.11	104.90	266.60	43.46	2.71		
8	1200.0	-61.14	-48.45	-34.60	-68.26	-72.30	-8.04	26.51
	60000.0	-21.92	-33.85	-20.08	-31.83	-21.51		
	5094.0	-6.26	-12.27	3.40	-18.55	-3.37		
8	1200.0	-63.66	-47.34	-29.95	-71.62	-76.00	-9.07	53.38
	56000.0	-19.55	-33.00	-16.09	-31.45	-20.18		
	8638.0	-9.90	-21.16	-3.56	-23.26	-8.32		
8	1200.0	-34.70	25.21	93.70	-55.62	-66.10	57.01	527.89
	45000.0	70.02	36.79	92.71	34.26	58.60		
	20722.0	36.48	-11.15	23.87	9.42	29.49		
8	1200.0	-56.96	-27.90	3.73	-68.76	-74.90	9.65	178.32
	50000.0	6.53	-13.18	15.49	-12.74	2.77		
	15552.0	2.10	-22.20	1.59	-15.74	0.72		
8	1300.0	12.58	217.90	232.80	-10.48	-44.13	24.64	479.35
	26000.0	51.92	73.67	73.11	55.32	31.52		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
8	21758.0	-37.08	-68.78	-63.40	-36.45	-48.99		
9	1000.0	0.18	-49.31	14.82	-32.83	-12.71		
	110000.0	45.26	-5.61	87.37	-21.87	79.61		
	3740.0	49.29	52.08	206.30	-23.35	131.90		
9	1200.0	-76.44	-64.63	-60.46	-75.87	-82.21	-44.54	-45.63
	70000.0	-55.50	-61.07	-54.39	-58.91	-61.98		
	1281.0	-53.67	-49.90	-43.20	-61.29	-45.94		
9	1200.0	-2.68	178.14	487.02	-27.29	-66.79	324.24	3003.00
	40000.0	412.23	177.79	498.30	225.06	226.50		
	12138.0	423.59	142.01	420.60	216.30	339.23		
9	1300.0	-54.50	-18.16	-9.92	-55.92	-70.37		
	42500.0	4.82	-0.77	5.97	0.62	-3.43		
	1262.0	4.66	-2.38	2.40	0.74	1.95		
10	1000.0	-51.63	-88.35	-81.95	-62.39	-50.68		
	125000.0	-68.24	-83.96	-80.33	-77.84	-49.31		
	31050.0	-77.79	-82.09	-75.58	-84.57	-68.81		
10	1100.0	-75.67	-84.02	-82.19	-73.92	-74.67		
	105000.0	-81.59	-83.04	-81.60	-82.14	-81.38		
	13707.0	-79.18	-81.80	-78.03	-81.84	-80.08		
10	1100.0	-81.09	-85.81	-80.40	-80.78	-82.67	86.25	504.12
	95000.0	-74.32	-81.59	-74.50	-79.97	-75.55		
	24602.0	-64.65	-74.70	-59.93	-76.15	-61.98		
10	1200.0	-90.89	-83.22	-75.18	-90.10	-93.33	2316.00	2260.00
	60000.0	-62.20	-74.18	-57.80	-73.71	-71.52		
	32472.0	-38.70	-57.98	-30.94	-61.53	-29.50		
10	1300.0	-82.27	-50.01	-29.89	-80.70	-88.96	344.00	1079.00
	35000.0	13.15	-20.30	13.19	-16.67	-11.98		
	14114.0	7.43	-12.00	13.27	-16.95	16.40		
10	1400.0	-58.27	11.53	52.63	-55.11	-79.83	-41.10	70.56
	15000.0	30.22	25.34	41.36	23.43	-4.26		
	12204.0	-18.95	-26.90	-15.97	-18.58	-39.14		
10	1400.0	-36.38	82.37	175.80	-31.43	-73.89	-28.99	274.10
	12000.0	44.28	61.99	94.20	43.96	-10.38		
	14910.0	18.56	2.11	25.09	16.89	-16.45		
11	1615.0	-94.52	23.50	30.33	-94.43	-97.95		
	15000.0	-36.14	9.02	6.59	-15.02	-69.47		
	2269.0	-56.19	-51.84	-14.65	-39.90	-81.51		
11	1440.0	-97.07	-60.93	-41.69	-96.81	-98.48		
	40000.0	-53.58	-46.04	-14.32	-58.92	-81.29		
	1819.0	-17.46	-20.57	-9.40	-18.63	-38.93		
11	1010.0	14.35	-75.53	11.40	-40.96	-38.10		
	130000.0	196.58	-34.49	54.76	4.57	367.85		
	1596.0	156.10	6.85	72.00	-15.76	453.52		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
12	1500.0	7.13	10.28	4.65	-9.42	-25.66	-48.79	10.55
	9000.0	9.45	-17.03	-10.63	2.65	-7.45		
	1420.6	20.36	-20.78	-1.80	10.66	-1.74		
13	1202.0	-28.79	-23.57	-16.65	-36.14	-34.63	-18.89	-7.09
	44800.0	-13.52	-19.05	-11.94	-18.90	-12.93		
	5270.0	-14.34	-19.43	-13.24	-19.50	-13.11		
13	1202.0	-19.41	-8.13	2.12	-30.75	-29.29	-13.36	19.01
	40320.0	2.82	-7.01	6.81	-6.32	1.54		
	8171.0	2.89	-7.09	7.39	-6.40	1.51		
13	1202.0	-7.70	12.46	27.71	-24.43	-29.06	-12.41	56.44
	35840.0	21.43	4.95	29.87	6.67	16.29		
	13386.0	23.27	5.46	34.44	7.55	16.55		
13	1292.0	43.12	89.56	79.04	33.04	22.43	1.80	102.50
	22400.0	47.69	37.17	58.20	41.89	32.30		
	10896.0	51.55	38.67	68.14	44.34	32.93		
14	1202.0	-53.20	-52.10	-31.96	-60.30	-61.49	21.31	54.18
	53760.0	-12.98	-33.86	-11.12	-30.30	-12.93		
	6443.0	1.15	-11.54	13.61	-20.16	10.37		
14	1202.0	-31.60	-22.65	16.74	-43.70	-46.45	111.24	199.99
	51520.0	46.97	8.52	53.48	13.66	43.83		
	5375.0	75.08	47.91	98.69	33.69	90.36		
14	1202.0	-54.06	-27.71	33.21	-65.60	-69.37	127.60	417.30
	44800.0	53.02	3.63	73.22	5.82	38.69		
	15294.0	89.27	41.41	120.15	30.48	99.90		
14	1292.0	-46.94	91.08	196.60	-56.60	-69.46	160.70	723.10
	29120.0	128.10	101.78	175.20	86.97	80.25		
	12094.0	139.06	91.73	141.21	103.50	118.53		
14	1292.0	-62.62	44.52	130.90	-69.96	-79.24	87.65	593.70
	28000.0	69.97	49.49	108.68	37.45	32.18		
	20399.0	73.19	35.27	74.04	45.85	55.46		
14	1382.0	-61.49	29.34	45.74	-64.50	-74.73	13.00	103.30
	22400.0	14.65	21.45	25.79	13.78	-2.26		
	7593.0	0.87	-4.04	-4.85	4.24	-8.76		
14	1382.0	-41.36	206.30	278.10	-50.24	-69.98	31.27	669.90
	15680.0	85.96	108.75	136.02	79.47	37.70		
	22159.0	34.24	2.73	18.16	34.32	-0.05		
14	1499.0	64.77	218.70	173.78	60.90	10.50	-12.60	104.40
	8960.0	35.01	78.81	66.02	50.98	4.01		
	6830.0	29.00	7.51	12.44	41.00	-1.40		
15	1201.0	-52.98	-4.04	70.97	-65.76	-73.21	31.74	122.70
	60480.0	110.70	39.50	103.60	56.47	104.11		
	25662.0	115.78	55.33	103.02	64.88	124.88		
15	1381.0	-61.09	49.41	59.61	-64.32	-74.92	23.48	72.21

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	35840.0	25.66	43.83	38.00	34.55	11.54		
	10736.0	12.48	26.28	27.23	22.40	1.78		
15	1381.0	-63.87	53.58	65.22	-67.64	-78.23	13.43	83.78
	33600.0	26.37	45.46	40.85	35.69	11.39		
	16172.0	6.98	20.99	26.43	16.05	-6.04		
15	1498.0	-1.38	128.77	79.10	-7.70	-40.86	-12.49	86.62
	15680.0	9.00	54.70	45.74	27.49	-9.96		
	25451.0	-10.80	13.05	32.96	0.13	-31.76		
16	1111.0	-47.89	-50.24	-18.06	-63.44	-60.21	-9.05	62.63
	62720.0	-7.43	-33.76	4.47	-33.77	-9.54		
	2291.0	0.96	-21.89	14.03	-26.10	5.93		
16	1201.0	-36.78	46.34	46.60	-51.22	-62.90	35.02	264.90
	40320.0	45.25	19.20	56.79	25.24	19.08		
	2241.0	45.87	17.24	47.66	28.73	24.84		
16	1291.0	-23.65	274.70	185.50	2.61	-32.74	-2.62	312.50
	22400.0	94.57	79.34	104.00	93.71	47.26		
	3134.0	66.34	25.47	57.97	61.54	16.45		
16	1291.0	57.79	378.10	264.30	30.93	-14.17	24.26	426.30
	22400.0	148.28	128.80	160.32	147.20	87.91		
	2456.0	112.26	60.41	101.60	106.13	48.60		
16	1291.0	270.20	1308.10	976.30	178.63	65.43	-0.10	2072.90
	15680.0	249.25	172.36	301.40	215.98	103.60		
	8411.0	202.86	69.59	184.70	164.90	62.70		
16	1381.0	332.90	614.80	464.20	325.88	204.18	67.90	899.40
	13440.0	151.32	146.26	161.57	169.57	83.55		
	1447.0	135.27	84.43	118.25	144.70	62.35		
16	1381.0	1008.10	1805.80	1378.20	995.40	599.12	-7.36	2869.60
	8960.0	119.79	70.82	159.85	110.40	5.59		
	5380.0	198.47	103.56	167.11	203.90	75.41		
16	1381.0	2878.00	5172.00	3939.20	2854.00	1641.00	-27.89	8773.10
	6720.0	117.07	33.47	191.06	83.77	-29.64		
	9900.0	389.30	234.90	324.00	405.90	179.90		
17	1382.0	-61.51	-65.77	-58.19	-66.25	-67.46	-3.69	23.00
	49280.0	-45.54	-45.09	-33.63	-54.13	-37.12		
	1418.0	-45.09	-27.80	-9.99	-53.67	-37.13		
17	1472.0	-59.95	-44.18	-32.42	-64.14	-70.19		
	29120.0	-19.95	-25.24	-16.12	-28.21	-17.34		
	1508.0	-18.96	-15.69	-8.31	-26.52	-14.88		
17	1562.0	-32.80	7.59	21.11	-39.32	-52.51	169.73	339.70
	15680.0	32.54	34.46	36.04	27.77	37.13		
	1320.0	15.90	14.83	12.45	11.25	17.75		
17	1652.0	-65.70	-58.20	-58.20	-66.40	-68.48	-58.15	-54.50
	12320.0	-56.02	-52.84	-54.90	-54.78	-54.66		
	1178.0	-59.80	-58.28	-60.02	-59.04	-59.50		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
17	1652.0	-15.67	6.00	5.71	-20.17	-33.18	144.17	526.10
	8960.0	3.12	10.81	4.17	5.34	6.12		
	1250.0	-11.64	-21.39	-25.32	-11.78	-12.80		
18	1800.0	3.01	135.39	75.42	3.64	-31.92	-17.12	29.49
	13000.0	1.66	51.55	33.29	21.72	-20.51		
	1779.0	-18.77	-13.86	-4.54	-4.07	-41.86		
18	1800.0	9.95	172.22	94.86	11.86	-31.04	-24.77	39.56
	12000.0	-4.44	54.65	37.61	15.75	-30.61		
	2440.0	-16.20	-11.76	0.89	-0.55	-41.89		
18	1700.0	-55.39	69.00	56.72	-57.76	-70.99		
	25000.0	10.56	40.23	26.50	24.39	-7.44		
	1013.0	-12.44	-3.79	-5.75	2.11	-28.01		
18	1700.0	-48.85	200.90	162.60	-52.65	-73.84	20.80	177.17
	19000.0	24.48	89.49	74.35	46.56	-11.32		
	3468.0	-15.65	-10.10	3.18	2.22	-44.54		
18	1650.0	-66.22	52.16	52.22	-68.32	-79.25	164.50	74.14
	30000.0	0.14	27.06	20.42	9.20	-21.39		
	1322.0	-8.82	-2.26	-2.39	3.09	-23.94		
18	1500.0	-66.96	12.70	46.98	-70.40	-79.88	140.29	191.80
	50000.0	3.69	10.49	29.70	-3.48	-23.37		
	1584.0	37.21	22.89	45.77	25.82	22.18		
18	1500.0	-59.07	157.40	299.80	-67.90	-81.69	318.33	1085.50
	40000.0	109.67	125.89	209.30	81.31	33.30		
	4355.0	137.21	94.85	180.80	107.90	81.57		
18	1350.0	-43.30	-55.03	-34.67	-56.36	-56.68		
	80000.0	-9.94	-38.39	-16.98	-29.55	-5.56		
	1468.0	-2.89	-23.14	-3.01	-26.40	7.54		
19	1700.0	-19.09	201.61	204.70	-17.28	-73.85	56.36	330.50
	15000.0	128.30	278.30	304.20	141.50	84.11		
	1896.0	126.43	225.70	308.88	137.60	71.60		
19	1700.0	-35.44	140.70	143.20	-33.99	-79.13	24.77	243.50
	15000.0	82.20	201.88	222.60	92.73	46.92		
	2376.0	80.69	159.90	226.28	89.59	36.93		
19	1700.0	-48.61	134.80	144.10	-47.93	-87.83	-23.66	292.10
	12500.0	43.12	270.80	304.30	54.26	-0.69		
	6905.0	41.98	164.90	306.01	51.69	-7.20		
19	1500.0	-42.85	20.40	69.20	-45.17	-72.32	1.41	23.70
	40000.0	74.02	-14.89	22.78	36.12	48.15		
	1738.0	77.83	3.17	18.37	42.01	100.80		
19	1500.0	-48.09	34.06	117.10	-53.53	-81.20	-5.56	58.49
	35000.0	116.47	-6.81	57.04	54.09	79.69		
	3765.0	120.92	16.29	52.11	60.40	143.42		
19	1500.0	-58.20	43.80	184.30	-66.05	-89.94	-31.95	107.20
	29000.0	152.28	4.48	120.20	58.88	95.54		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
19	12128.0	156.50	29.36	115.28	64.20	157.33		
19	1500.0	-74.47	-12.18	73.60	-79.27	-93.86	-58.45	26.50
	29000.0	54.05	-36.20	34.45	-2.99	19.40		
	19862.0	56.60	-21.01	31.45	0.26	57.13		
19	1350.0	-25.68	-52.19	-19.22	-38.62	-50.58	-33.63	-28.95
	70000.0	0.77	-61.54	-40.80	-30.80	12.88		
	2380.0	2.04	-53.03	-42.59	-29.47	33.39		
19	1350.0	-29.31	-40.31	39.09	-49.48	-68.50	-24.32	9.21
	60000.0	77.30	-60.30	-16.21	-5.23	89.19		
	5832.0	81.45	-45.82	-20.35	-1.44	159.11		
19	1350.0	-31.81	-56.13	-25.88	-43.68	-54.66	-39.10	-34.81
	70000.0	-7.54	-64.70	-45.68	-36.50	3.56		
	2594.0	-6.38	-56.90	-47.32	-35.29	22.39		
19	1350.0	-44.77	-45.62	51.94	-63.62	-80.36	-38.69	11.89
	55000.0	90.74	-66.62	-15.38	-10.96	96.17		
	12033.0	95.99	-52.10	-20.10	-6.69	185.20		
21	1498.0	-43.40	-56.72	-38.03	-54.40	-54.82	-27.19	-15.67
	53760.0	-23.37	-41.48	-20.30	-44.39	-9.83		
	1658.0	-22.59	-30.02	-20.34	-43.96	-3.07		
21	1597.0	-63.61	-53.71	-32.53	-69.10	-77.49	-25.44	11.87
	35840.0	-24.80	-41.39	-21.16	-42.00	-24.29		
	2521.0	-23.67	-32.68	-21.23	-41.14	-14.40		
21	1741.0	-51.90	-20.18	-5.22	-54.60	-70.24	-11.60	20.84
	22400.0	-3.43	-10.44	-2.26	-9.81	-6.49		
	1120.0	-3.53	-8.29	-2.24	-9.72	-4.27		
22	1500.0	-32.27	28.86	22.11	-32.90	-51.55	15.40	47.84
	25000.0	-0.57	28.65	22.35	11.79	-10.45		
	1152.0	-20.51	0.67	7.29	-11.45	-34.18		
23	1100.0	-73.76	-41.52	-34.37	-77.34	-83.94	-49.89	-41.46
	75000.0	-15.93	-31.43	-5.86	-32.68	-32.59		
	19362.0	-8.22	-18.43	-9.16	-24.40	-4.68		
23	1200.0	-83.78	-34.90	-51.63	-84.74	-90.56	-54.01	-38.04
	55000.0	-37.91	-37.60	-33.33	-40.67	-51.61		
	23550.0	-36.11	-39.72	-32.28	-37.09	-40.82		
23	1200.0	-81.62	-41.08	-56.74	-82.23	-88.08	-53.22	-47.91
	60000.0	-45.20	-43.40	-41.96	-46.10	-56.08		
	12342.0	-42.29	-41.41	-42.01	-41.41	-43.83		
23	1300.0	-49.37	117.80	42.72	-53.62	-73.03	26.22	121.20
	35000.0	52.60	75.70	57.93	66.79	25.22		
	14207.0	39.60	14.24	71.54	51.48	5.35		
24	1400.0	22.87	33.31	112.60	-0.19	-40.12	51.26	80.67
	60000.0	141.60	27.19	56.15	77.03	164.70		
	1414.0	142.76	29.16	63.98	76.29	180.47		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
24	1500.0	-76.94	-16.11	25.29	-80.65	-93.01	-41.08	26.89
	35000.0	16.85	-15.99	14.07	-7.28	-0.87		
	9847.0	12.01	-18.35	11.19	-9.61	6.66		
24	1500.0	-24.36	71.51	121.43	-30.47	-64.28	65.93	121.55
	42000.0	125.20	72.99	97.50	92.94	101.57		
	1270.0	136.00	77.44	103.70	105.20	140.00		
24	1500.0	-54.28	3.67	33.85	-57.97	-78.41	0.30	33.92
	42000.0	36.15	4.57	19.40	16.63	21.84		
	2101.0	42.65	7.26	23.13	24.06	45.08		
24	1600.0	-62.20	135.04	167.08	-65.69	-90.08	18.60	245.60
	22000.0	102.40	131.40	210.90	101.70	61.43		
	5470.0	60.44	99.38	168.80	59.49	26.37		
24	1600.0	-68.72	44.30	58.16	-70.61	-89.12	0.50	97.41
	25000.0	36.65	45.20	73.66	36.10	14.75		
	3724.0	17.73	31.54	56.73	18.11	1.62		
24	1700.0	-58.31	172.33	135.42	-59.39	-89.14	21.40	272.00
	14000.0	42.56	152.55	221.17	76.95	12.14		
	4322.0	-0.37	102.40	168.20	17.89	-33.07		
24	1700.0	-59.53	57.74	40.38	-59.94	-82.61	30.37	97.80
	18000.0	18.33	56.07	67.97	36.79	6.81		
	1518.0	-7.43	33.93	46.06	4.80	-24.12		
24	1800.0	-54.24	96.16	40.56	-52.80	-86.80	-4.19	145.20
	9000.0	-33.12	66.63	92.78	-4.34	-50.34		
	3332.0	-49.37	40.65	76.60	-32.86	-67.99		
24	1800.0	-43.59	69.98	32.39	-43.26	-76.62	33.34	104.12
	11000.0	-10.14	54.81	62.62	17.41	-20.29		
	1189.0	-33.44	29.78	44.67	-18.68	-51.65		
				Cobalt Alloys				
1	1700.0	-33.52	-43.22	-37.40	-35.97	-55.47	-7.83	38.60
	8000.0	-26.89	-14.37	-19.91	-27.58	-20.70		
	103.0	-2.11	-27.59	-24.40	1.33	-10.65		
1	1700.0	9.41	-11.38	2.19	2.22	-34.49	-3.59	215.70
	6000.0	18.32	2.66	-1.42	13.57	11.76		
	209.0	45.43	-19.81	-7.46	45.60	20.40		
1	1700.0	108.86	57.01	93.04	86.96	6.75	-28.61	852.98
	4000.0	113.06	-16.50	-11.87	94.17	38.52		
	599.0	61.98	-26.72	-11.18	42.85	17.02		
2	1350.0	-42.45	-63.88	-55.60	-52.55	-44.10		
	22500.0	-60.21	-52.92	-45.02	-64.10	-56.60		
	603.0	-58.89	-58.93	-47.34	-63.36	-56.01		
2	1500.0	-10.27	-6.75	-4.03	-9.73	-5.77	42.13	84.71
	15000.0	7.08	-11.83	-8.04	4.29	4.00		
	533.0	-8.09	-36.94	-18.04	-10.60	-10.58		
2	1500.0	-28.19	-25.37	-23.19	-22.76	-24.59	13.75	47.82

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
2	15000.0	-14.31	-29.43	-26.40	-16.53	-16.77		
	666.0	-26.44	-49.53	-34.40	-28.46	-28.44		
2	1500.0	-22.62	-19.58	-17.23	-22.15	-18.73	22.58	59.30
	15000.0	-7.65	-23.95	-20.68	-10.05	-10.30		
	618.0	-20.73	-45.61	-29.31	-22.90	-22.81		
3	1500.0	-86.89	-54.66	-48.98	-86.50	-90.98	-60.74	-37.72
	14000.0	-57.31	-55.60	-49.50	-60.15	-67.68		
	2850.0	-59.63	-66.73	-58.06	-61.56	-61.72		
3	1600.0	-64.93	61.61	56.95	-63.40	-79.15	-24.07	34.29
	8000.0	2.91	42.24	61.73	6.35	-28.34		
	1671.0	-19.30	-51.70	-5.05	-16.19	-36.25		
3	1600.0	-38.53	73.94	70.53	-37.17	-55.49	16.82	41.54
	10000.0	45.04	64.95	71.93	47.82	20.56		
	582.4	8.67	-11.13	15.89	13.36	-2.90		
3	1600.0	-52.65	-10.06	-11.14	-52.43	-59.73	-27.83	-28.05
	12000.0	-14.45	-11.90	-11.61	-13.80	-20.41		
	505.5	-31.62	-37.15	-31.06	-29.07	-33.54		
3	1700.0	-12.62	98.50	73.14	-8.63	-39.72	26.21	58.07
	6000.0	23.33	78.44	82.00	35.12	-6.18		
	569.1	29.02	-16.51	46.19	37.54	7.74		
4	1200.0	82.42	96.85	151.52	50.13	-39.30	116.19	351.98
	38000.0	134.30	96.14	121.27	104.00	113.87		
	6473.0	103.18	53.80	67.30	83.42	86.27		
5	1350.0	-86.39	-91.89	-85.93	-90.87	-89.06	-87.30	-72.70
	25000.0	-85.77	-87.86	-80.53	-90.59	-83.72		
	25499.0	-86.68	-87.56	-82.94	-91.00	-84.67		
5	1350.0	2.31	-32.71	-2.85	-21.21	-1.73	16.59	54.19
	30000.0	2.61	1.58	39.41	-22.76	18.55		
	1031.0	-6.66	5.02	17.90	-27.13	9.17		
5	1350.0	-77.57	-85.25	-78.70	-82.23	-78.46	-74.40	-66.20
	30000.0	-77.51	-77.73	-69.44	-83.07	-74.01		
	4703.0	-79.54	-76.98	-74.15	-84.03	-76.07		
5	1500.0	-68.90	-72.84	-66.79	-73.50	-80.52	-60.60	91.68
	12500.0	-73.33	-81.70	-79.54	-76.54	-77.13		
	19651.0	-71.33	-82.50	-76.16	-75.51	-75.47		
5	1500.0	-77.78	-79.19	-75.87	-80.15	-84.82	-64.45	-13.09
	15000.0	-77.84	-81.17	-79.75	-79.84	-78.94		
	9154.0	-76.37	-81.55	-77.92	-79.11	-77.68		
5	1500.0	-82.42	-82.45	-80.64	-83.66	-87.08	-70.04	-53.20
	17550.0	-80.84	-81.93	-81.04	-82.07	-80.88		
	4566.0	-80.23	-82.06	-80.48	-81.81	-80.40		
5	1600.0	-33.52	-34.87	-39.41	-31.01	-48.66	44.42	274.70
	10000.0	-51.42	-63.89	-66.91	-48.14	-60.19		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
5	3248.0	-51.14	-65.53	-62.83	-47.79	-59.61		
5	1600.0	-24.93	-22.11	-26.51	-22.58	-40.06	71.53	139.40
	12000.0	-32.90	-37.11	-42.85	-29.10	-37.98		
	1010.0	-28.71	-38.54	-36.93	-26.25	-34.04		
5	1600.0	-69.97	-67.29	-68.76	-69.19	-75.33	-38.59	-40.82
	14000.0	-69.32	-68.10	-70.62	-67.90	-69.85		
	1042.0	-67.28	-68.35	-68.63	-66.60	-67.90		
6	1100.0	-66.43	-78.07	-63.97	-71.98	-56.15	4.89	18.15
	73000.0	-67.50	-61.20	-53.34	-74.03	-58.46		
	715.2	-65.93	-45.70	-31.14	-71.74	-58.37		
6	1100.0	-54.50	-71.32	-49.73	-64.79	-47.41	98.18	145.50
	70000.0	-55.02	-47.60	-31.59	-65.99	-40.39		
	799.3	-54.71	-21.76	10.28	-64.77	-40.36		
6	1350.0	-71.48	-64.27	-71.49	-71.83	-82.80	-46.77	-54.34
	40000.0	-69.22	-68.70	-70.80	-67.05	-69.43		
	527.2	-70.45	-64.10	-67.08	-69.38	-69.52		
7	1350.0	-36.51	-20.92	-31.31	-37.56	-60.52	13.47	24.24
	40000.0	-31.43	-26.40	-21.38	-22.57	-38.06		
	548.5	-29.30	-25.17	-23.16	-22.18	-38.30		
7	1600.0	22.64	48.98	3.01	63.76	33.33	4.57	39.04
	18000.0	8.20	10.01	76.12	25.65	-13.98		
	911.1	13.15	25.94	37.47	35.21	-10.28		
9	1400.0	-32.05	-29.28	-11.95	-42.40	-42.47	20.04	46.02
	45000.0	-9.17	-21.35	-7.67	-19.98	-8.34		
	168.0	-1.78	-10.32	1.84	-12.97	1.47		
9	1500.0	196.08	370.80	424.90	158.23	107.49	464.00	1120.60
	30000.0	281.07	291.50	332.20	264.13	232.63		
	133.6	196.50	153.20	199.85	184.40	153.04		
9	1500.0	120.65	266.19	315.28	87.71	47.74	277.50	981.10
	28000.0	166.38	175.20	218.23	148.71	121.30		
	322.3	101.34	60.60	105.30	88.15	62.54		
9	1600.0	24.49	58.53	43.43	24.59	5.85	18.90	55.66
	25000.0	16.79	29.65	25.17	22.56	6.46		
	160.5	-4.27	-10.90	-5.16	-1.11	-16.17		
10	1400.0	-58.57	9.18	72.75	-61.59	-78.69	45.45	-12.61
	45000.0	120.50	42.74	10.38	76.19	104.39		
	147.2	117.92	4.06	4.21	70.68	121.05		
10	1500.0	-49.22	193.20	331.02	-51.93	-72.19	172.80	404.40
	35000.0	349.70	266.70	205.90	294.60	212.74		
	111.6	352.01	182.30	185.90	295.70	302.50		
10	1600.0	-74.43	20.16	39.57	-74.65	-81.52	40.65	179.91
	30000.0	34.47	36.39	21.37	33.92	-4.88		
	160.8	36.04	19.58	17.35	36.76	22.85		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
10	1700.0	-84.13	-42.94	-42.43	-84.10	-85.98		
	25000.0	-44.43	-38.50	-41.04	-41.31	-56.59		
	207.8	-44.01	-39.60	-40.03	-40.16	-47.67		
10	1800.0	-89.74	-42.48	-48.26	-90.00	-92.16	44.21	37.50
	17500.0	-51.56	-41.40	-34.64	-41.79	-60.17		
	398.7	-52.82	-28.90	-26.46	-44.54	-62.50		
10	1800.0	-74.53	-32.25	-36.17	-74.80	-74.82	49.32	9.49
	20000.0	-34.70	-28.02	-26.66	-29.38	-40.71		
	116.7	-35.09	-22.49	-21.39	-29.69	-38.30		
10	1800.0	-76.16	-36.59	-40.27	-76.43	-76.43	39.74	2.47
	20000.0	-38.89	-32.64	-31.37	-33.91	-44.52		
	124.7	-39.25	-27.46	-26.43	-34.20	-42.26		
10	1800.0	-75.14	-33.89	-37.72	-75.43	-75.43	45.70	6.84
	20000.0	-36.28	-29.77	-28.44	-31.10	-42.15		
	119.6	-36.66	-24.37	-23.30	-31.39	-39.79		
10	1900.0	-77.20	-6.18	-21.88	-77.95	-82.75	141.40	82.18
	13000.0	-28.89	-11.68	6.90	-10.38	-35.50		
	190.6	-31.69	17.56	20.69	-17.39	-48.55		
10	2000.0	-76.44	11.32	-20.22	-76.90	-87.11	141.84	280.30
	8000.0	-55.57	-28.44	19.41	-38.05	-69.19		
	294.8	-56.32	7.38	18.23	-41.02	-70.32		
10	2000.0	-76.12	-33.20	-46.80	-76.83	-83.97	14.36	31.48
	9000.0	-60.31	-47.18	-30.38	-49.40	-66.36		
	224.6	-61.35	-29.56	-28.28	-52.55	-71.34		
11	1850.0	-65.73	-52.13	-48.95	-66.28	-78.87		
	10000.0	-32.48	3.44	-17.13	-33.58	-11.10		
	804.9	16.33	7.48	3.26	33.57	-9.16		
11	1800.0	-69.34	-52.80	-43.35	-71.49	-85.38		
	10000.0	-17.38	32.21	8.58	-25.48	17.30		
	2223.9	73.35	39.43	49.17	90.28	20.63		
11	1800.0	-78.81	-67.40	-60.85	-80.30	-89.90		
	10000.0	-42.90	-8.63	-24.96	-48.50	-18.94		
	3218.0	19.80	-3.64	3.09	31.50	-16.63		
11	1750.0	-73.50	-60.34	-52.30	-75.29	-86.39		
	13000.0	-26.91	14.64	0.54	-35.50	7.22		
	1571.1	38.80	18.52	26.87	39.87	9.67		
11	1625.0	-81.33	-76.45	-76.22	-80.58	-85.29		
	25000.0	-72.08	-73.20	-72.48	-72.59	-72.46		
	592.3	-73.06	-73.36	-72.70	-74.45	-72.63		
11	1600.0	16.18	49.15	126.01	-4.49	-42.93		
	20000.0	282.99	416.40	513.60	169.11	517.39		
	574.9	528.10	418.90	575.40	362.50	525.79		
11	1500.0	-73.36	-74.13	-62.67	-78.02	-81.29		
	30000.0	-48.17	-39.57	-23.03	-62.75	-25.07		
	1720.9	-38.26	-40.50	-27.73	-55.06	-24.78		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
11	1450.0	-78.81	-82.80	-74.49	-83.27	-82.65		
	35000.0	-67.38	-60.28	-48.48	-77.10	-50.20		
	2404.3	-60.83	-60.97	-53.03	-71.60	-49.84		
11	1325.0	-30.53	-69.09	-50.00	-54.36	-5.75		
	50000.0	-50.14	-5.04	18.07	-66.70	15.49		
	1190.7	-8.51	-7.00	9.28	-31.60	19.65		
12	1350.0	-0.76	-14.07	26.12	-28.98	-28.97	27.02	74.50
	27500.0	26.18	20.31	44.55	2.67	38.00		
	679.2	28.82	29.90	45.83	4.04	38.61		
12	1700.0	-37.41	-22.01	-33.04	-35.60	-50.63	-35.05	-16.97
	10000.0	-35.20	-32.70	-44.00	-27.20	-39.82		
	552.8	-22.41	-58.40	-38.98	12.22	-36.03		
13	1500.0	-43.87	-32.88	33.86	-65.77	-66.89	125.58	370.50
	14000.0	105.40	55.75	175.77	21.38	161.70		
	2338.0	110.08	85.67	165.90	20.86	161.84		
14	1200.0	-59.88	-62.37	-27.88	-73.74	-76.71	-65.35	-32.57
	40000.0	-21.09	-50.27	-29.67	-44.85	-18.43		
	1160.0	-18.80	-38.20	-32.50	-41.84	-4.61		
14	1200.0	-61.21	-63.62	-30.28	-74.61	-77.49	-66.50	-34.80
	40000.0	-23.72	-51.93	-32.00	-46.70	-21.15		
	1199.9	-21.50	-40.26	-34.74	-43.78	-7.79		
14	1200.0	-64.07	-66.30	-35.41	-76.48	-79.14	-68.97	-39.60
	40000.0	-29.33	-55.47	-37.01	-50.61	-26.95		
	1295.2	-27.28	-44.65	-39.50	-47.91	-14.57		
14	1200.0	-71.55	-73.32	-48.87	-81.38	-83.49	-75.43	-52.19
	40000.0	-44.05	-64.74	-50.13	-60.90	-42.17		
	1636.1	-42.40	-56.19	-52.14	-58.77	-32.37		
14	1200.0	-53.08	-52.40	5.96	-72.35	-76.93	-65.12	-34.68
	37500.0	10.12	-34.91	2.62	-28.30	8.92		
	1693.6	13.06	-20.14	-0.48	-24.38	28.32		
14	1200.0	-59.13	-54.95	17.77	-78.48	-83.17	-74.80	-53.50
	35000.0	14.16	-36.77	13.33	-31.19	7.06		
	3445.5	16.55	-24.54	11.77	-27.77	25.50		
14	1200.0	16.92	49.30	417.41	-49.49	-64.76	-51.19	-6.67
	31000.0	327.78	113.12	393.70	124.80	259.70		
	3294.0	329.40	138.60	407.60	131.20	306.61		
14	1200.0	-62.53	-48.13	109.90	-85.48	-90.49	-87.76	-75.38
	29000.0	55.88	-26.39	99.62	-24.14	22.41		
	17867.6	54.50	-23.73	111.09	-23.27	33.95		
14	1200.0	-12.13	26.92	457.20	-67.85	-79.61	-74.96	-47.90
	28000.0	288.90	78.78	429.30	81.72	193.88		
	10192.3	282.70	78.67	468.70	81.91	215.19		
14	1200.0	-35.12	0.18	399.82	-78.30	-86.93	-85.24	-67.25

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
14	26500.0	213.94	38.63	374.10	37.59	122.66		
	21789.6	205.23	30.22	423.03	35.42	130.57		
14	1350.0	-90.56	-81.39	-75.72	-92.12	-95.27	-90.32	-87.85
	29000.0	-77.96	-77.44	-76.70	-78.11	-81.80		
	1969.1	-77.57	-77.18	-76.61	-77.03	-78.96		
14	1350.0	-86.74	-72.27	-61.97	-89.47	-93.99	-87.35	-84.28
	27500.0	-66.30	-66.04	-63.50	-67.12	-72.57		
	2098.8	-66.06	-66.50	-62.68	-66.02	-69.27		
14	1350.0	-92.46	-83.22	-75.75	-94.32	-96.92	-93.46	-91.80
	26000.0	-79.23	-79.38	-76.75	-80.13	-83.44		
	5654.4	-79.33	-80.35	-75.68	-79.84	-82.12		
14	1350.0	-90.51	-77.97	-66.93	-93.12	-96.40	-92.39	-90.29
	25000.0	-72.51	-72.95	-68.31	-74.08	-78.45		
	6055.2	-72.87	-74.94	-66.32	-74.05	-77.38		
14	1500.0	-67.17	-14.05	-13.86	-71.90	-85.40	-52.39	-78.17
	17000.0	-27.01	-7.10	-15.87	-12.20	-37.37		
	1157.1	-32.05	-27.38	-3.32	-21.34	-49.54		
14	1500.0	-63.43	-17.35	-17.16	-72.98	-85.96	-54.31	-79.01
	17000.0	-29.80	-10.66	-19.10	-15.56	-39.77		
	1203.2	-34.56	-30.17	-7.03	-24.35	-51.42		
14	1500.0	-77.14	-40.16	-40.02	-80.43	-89.80	-66.92	-84.80
	17000.0	-49.18	-35.52	-41.40	-38.86	-56.39		
	1661.8	-52.69	-49.44	-32.68	-45.23	-64.87		
14	1500.0	-78.04	-42.50	-42.37	-81.20	-90.23	-68.21	-85.40
	17000.0	-51.16	-37.84	-43.70	-41.25	-58.10		
	1729.4	-54.54	-51.41	-35.32	-47.37	-66.24		
14	1500.0	-78.47	-43.65	-43.52	-81.57	-90.42	-68.45	-85.69
	17000.0	-52.14	-39.09	-44.80	-42.32	-58.93		
	1764.7	-55.45	-52.39	-36.60	-48.42	-66.92		
14	1500.0	-78.93	-44.84	-44.71	-81.96	-90.63	-69.51	-85.99
	17000.0	-53.14	-40.37	-46.00	-43.64	-59.80		
	1802.8	-56.39	-53.39	-37.90	-49.51	-67.62		
14	1500.0	-81.10	-50.50	-50.42	-83.83	-91.59	-72.65	-87.44
	17000.0	-57.99	-46.53	-51.58	-49.46	-63.95		
	2010.3	-60.89	-58.20	-44.35	-54.72	-70.96		
14	1500.0	-76.45	-31.02	-30.93	-80.73	-91.10	-74.80	-84.87
	15000.0	-48.03	-31.33	-31.99	-37.50	-58.68		
	3883.8	-52.89	-52.38	-19.18	-46.30	-69.52		
14	1500.0	-54.60	68.72	68.54	-66.26	-87.86	-79.36	-72.89
	11500.0	-14.30	25.52	70.28	-0.42	-47.27		
	13018.2	-23.95	-34.79	109.49	-18.90	-64.97		
15	1400.0	-35.96	-50.43	-44.03	-42.99	-38.81	-29.68	-23.12
	45000.0	-38.96	-50.84	-44.12	-46.30	-34.87		
	1709.0	-38.47	-50.79	-47.47	-46.50	-34.29		
15	1600.0	-34.90	-18.35	-16.91	-32.86	-54.17	2.78	37.05
	20000.0	-24.57	-18.01	-15.60	-22.23	-31.72		

Table 31. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	1309.0	-27.99	-21.20	-15.38	-25.30	-34.98		
16	1800.0	-73.92	0.71	-14.24	-71.69	-87.00	-86.19	-96.69
	7000.0	-66.05	-24.17	-40.60	-57.92	-81.99		
	2535.0	-32.27	39.36	96.07	-25.72	-59.05		
17	1050.0	-41.80	-58.16	-52.23	-47.90	-47.75		
	60000.0	43.60	-10.39	8.61	34.45	38.84		
	1693.0	50.17	-32.44	7.64	37.30	40.27		
17	1050.0	-73.13	-82.08	-78.76	-76.63	-76.40	-47.10	-34.14
	55000.0	-34.30	-62.79	-53.16	-39.87	-37.40		
	5388.0	-29.05	-75.21	-55.90	-37.50	-36.17		
17	1000.0	-57.58	-73.95	-65.61	-66.07	-62.90		
	62000.0	36.77	-33.65	-1.03	11.55	30.95		
	4244.0	42.72	-52.39	0.34	13.60	32.11		
18	1100.0	-32.29	22.51	-4.17	-35.90	-46.09	-1.39	-5.28
	55000.0	-17.85	-19.05	-3.31	-13.31	-24.22		
	1465.0	2.79	34.21	35.03	3.34	-11.63		
18	1100.0	25.49	141.18	85.51	15.76	-4.34	33.27	80.71
	50000.0	28.20	11.91	81.67	28.84	8.91		
	2414.0	56.24	126.03	143.40	50.70	24.71		
18	1050.0	-44.06	9.62	-6.94	-52.01	-58.52		
	60000.0	-20.94	-27.17	-4.31	-21.77	-27.47		
	3032.0	-0.89	21.08	37.49	-7.36	-15.82		
18	1050.0	-47.82	2.27	-13.81	-55.23	-61.30		
	60000.0	-26.24	-32.05	-10.73	-27.01	-32.34		
	3250.0	-7.54	12.95	28.27	-13.58	-21.47		
18	1050.0	23.18	174.58	130.63	-0.22	-15.12	75.19	141.87
	55000.0	59.86	31.04	132.60	49.79	36.21		
	3946.0	114.60	189.40	268.90	87.23	65.84		

* Not Included in the Averaged Values.

Table 32. Average Values of Percentage Deviation of Rupture-Time (Equation 24) for Internal Extrapolation: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D
			Austenitic Steels		
Value	46.47	41.04	58.01	40.82	39.06
Rank	4	3	5	2	1
			Ferritic Steels		
Value	135.11	139.23	141.36	140.10	89.10
Rank	2	3	5	4	1
			Aluminum Alloys		
Value	119.67	163.44	189.42	111.81	64.33
Rank	3	4	5	2	1
			Nickel Alloys		
Value	60.86	67.25	103.60	49.55	42.42
Rank	3	4	5	2	1
			Cobalt Alloys		
Value	60.78	52.51	67.42	51.99	59.12
Rank	4	2	5	1	3
			All Data		
Value	81.26	87.80	108.03	75.40	57.03
Rank	3	4	5	2	1

Table 33. Average Values of Percentage Deviation of Rupture-Time (Equation 24) for Internal Extrapolation: Third Order Polynomial.

	L-M	M-H	S-G	M-S	S-D
			Austenitic Steels		
Value	45.60	33.61	51.36	38.99	40.71
Rank	4	1	5	2	3
			Ferritic Steels		
Value	93.47	47.54	58.43	96.06	63.72
Rank	4	1	2	5	3
			Aluminum Alloys		
Value	71.03	65.37	182.05	76.79	61.71
Rank	3	2	5	4	1
			Nickel Alloys		
Value	56.43	44.31	82.04	43.99	49.05
Rank	4	2	5	1	3
			Cobalt Alloys		
Value	63.21	52.43	66.43	52.55	60.43
Rank	4	1	5	2	3
			All Data		
Value	64.55	47.28	84.13	59.58	53.93
Rank	4	1	5	3	2

Exterior Extrapolation

Stress Extrapolation

Table 34 lists the calculated percentage deviations of stress, as defined by Equation 23, for each long-time data point involved with exterior extrapolation. Compared are the actual and predicted values of stress for long-time data points, as calculated by the computer from known values of rupture-time and temperature for the long-time points, based on known information for short-time data points. For each data point treated in Table 34 there are three horizontal columns: the first gives results obtained when the master curve was represented by a first order polynomial, the second gives results obtained when the master curve was represented by the best second order polynomial, etc. Under the vertical column headed "A" is listed the actual temperature of the test (^{o}F), the actual stress value utilized in the test (psi), and the experimentally determined value of rupture-time.

Again, it should be noted that it was not possible to make as many extrapolations by the Conrad and Korchynsky methods as could be made by the utilization of the other five correlation methods. The Conrad and Korchynsky methods were not used for exterior extrapolation unless there were at least three other data points (short-time) at the same temperature as the point to be extrapolated.

Concerning Table 34 there is a particular problem as regards exterior extrapolation based on third order polynomial approximations to master curves. In several cases there is an abrupt change of slope in the polynomial approximation to the master curves before the external extrapolation points are reached: in some cases the external

extrapolation point is completely outside of the stress range of the polynomial equations used to represent master curves. In both of these cases there is the result that the percentage deviation of stress is large, and in some cases as indicated by "note 2" in the table the percentage deviation of stress becomes incalculable. Hence, it was not really possible to obtain average values of percentage deviation of stress when third order polynomial approximations to the master curves were being used.

Averaged values of the percentage deviation of stress are listed in Tables 35 and 36 for the cases of first and second order polynomial approximations to master curves, respectively. In Table 36 two values are listed for the Conrad and Korchynsky methods: the smaller value omitted the calculated deviations of stress for the aluminum alloy Code 1 data point, while the larger includes these numbers.

Rupture-Time Extrapolation

Table 37 lists the calculated percentage deviations of rupture-time for each long-time data point involved with exterior extrapolation. Compared are the actual and predicted values of rupture-time for long-time data points, as calculated by the computer from known values of stress and temperature for the long-time points, based on known information for the short-time data points.

Tables listing the averaged values obtained from Table 37 have not been prepared, since many of the extrapolations are quite poor or impossible, and large values of percentage deviation of rupture-time result.

Table 34. Percentage Deviation of Stress (Equation 23): Exterior Extrapolation.

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1350.0	8.75	7.59	5.14	11.17	12.30	-23.68	1.54
	5800.0	0.33	-16.08	-6.27	-0.10	-8.35		
	30368.4	-12.21	-13.69	-10.31	19268.79	-9.76		
2	1350.0	6.45	8.12	3.83	10.00	10.15	6.86	13.30
	7000.0	8.35	12.51	11.49	9.17	5.24		
	8537.7	6.14	10.18	9.31	6.65	17.36		
3	1350.0	4.07	3.14	0.44	5.92	5.19	0.58	5.30
	8000.0	-0.60	5.96	3.57	-0.31	-4.69		
	12529.1	2.61	6.67	1.58	3.29	3.24		
4	1650.0	-15.64	15.07	4.80	0.26	-0.31	-87.31	37.23
	1000.0	51.04	69.32	70.56	49.44	35.64		
	10083.0	49.88	23.64	41.43	49.11	12.13		
4	1800.0	-17.21	28.34	20.72	-2.32	5.28	25.33	38.93
	1000.0	39.53	40.03	38.32	40.18	37.30		
	1833.0	21.97	13007.00	14.12	22.58	12303.00		
4	1800.0	-20.84	61.01	41.72	5.62	15.87	-20.14	91.14
	500.0	96.33	103.88	98.86	98.76	86.80		
	10080.0	33348.00	29250.00	30556.00	33254.00	27842.00		
5	1500.0	10.14	15.13	12.49	13.53	16.03	-30.36	-2.98
	3000.0	7.01	-10.10	-14.86	7.52	3.85		
	13145.8	12.38	9.53	9.03	12.11	10.73		
6	1350.0	-3.37	-45.88	-15.93	-2.56	-2.30	-44.26	-28.98
	7400.0	-26.93	-18.49	-27.00	-26.95	-23.83		
	12955.9	-9.53	-12.95	-10.32	-9.15	-10.04		
7	1350.0	27.15	6.18	20.80	28.14	24.80	-15.10	6.64
	5000.0	74.73	-9.04	-4.93	91.37	-44.80		
	11960.7	8.24	6.18	3.09	10.71	12.03		
7	1350.0	33.07	7.56	26.04	34.86	28.87	-45.90	7.76
	4000.0	-58.41	-27.73	-14.73	-51.76	-43.61		
	24406.4	15.49	8.59	2.74	19.55	22.80		
8	1350.0	18.14	9.48	1.90	20.62	20.11	-46.14	-3.59
	5200.0	-28.54	38.81	-27.71	9.63	84.17		
	11458.5	Note 2	-100.00	Note 2	Note 2	-99.20		
9	1350.0	3.23	3.45	1.59	5.19	6.00	-26.93	-13.09
	7500.0	0.09	-3.94	-2.54	1.09	-4.83		
	10978.5	0.23	0.43	0.98	-0.73	0.42		
10	1350.0	4.35	-4.53	-12.48	7.60	6.25	-33.85	-10.74
	6500.0	-32.33	-15.44	-13.83	-33.14	23.65		
	26405.5	9.30	15.52	13.27	10.26	9.81		
11	1600.0	3.47	14.82	3.02	11.11	15.67	-119.06	-21.18
	2500.0	-11.63	143.03	-35.23	-12.19	-29.79		
	12303.0	20.48	16.75	14.51	19.63	16.04		

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
14	1291.0	8.66	-4.99	1.25	9.80	10.99	-8.90	-1.64
	11200.0	-13.56	-14.61	-7.88	-19.22	-30.13		
	10698.0	2.28	3.50	3.43	3.06	1.32		
14	1291.0	22.69	4.48	12.68	24.34	25.79	-8.80	8.62
	8960.0	-22.25	-28.46	-3.99	2.55	30.34		
	25829.0	16.29	18.52	18.30	17.78	14.70		
16	1561.0	68.46	46.85	32.65	81.55	91.11	-67.18	48.01
	1120.0	0.39	-8.39	14.68	7.13	83.92		
	13355.0	50.48	55.56	49.33	52.79	53.16		
20	1500.0	15.31	15.50	12.90	20.88	23.59	8.91	16.96
	10000.0	15.27	11.35	15.51	16.49	7.49		
	11257.0	16.05	13.55	16.58	17.93	13.58		
20	1500.0	10.65	11.04	8.13	16.50	18.86	1.74	12.29
	10000.0	10.62	5.79	10.96	11.85	1.52		
	15335.0	11.50	8.42	12.16	13.07	8.70		
24	1500.0	13.04	21.69	16.61	17.70	21.85	-47.42	-5.74
	3000.0	3.43	-40.91	53.71	5.13	-3.76		
	14233.0	26.16	22.33	19.77	26.80	23.49		
25	1500.0	16.57	16.79	12.19	20.28	20.33	-79.22	-30.08
	2800.0	-3.31	80.14	59.04	-2.52	-23.56		
	16867.4	6.47	2.51	-1.64	5.14	1.58		
26	1292.0	9.96	7.52	-0.40	14.09	12.25	-71.70	1.07
	5690.0	-11.82	-2.03	2.74	-20.87	-23.20		
	19250.0	27.72	27.16	26.44	28.06	28.81		
27	1292.0	20.55	4.39	12.60	21.73	21.26	-33.09	-9.61
	8820.0	72.70	27.26	-22.48	-46.14	-40.88		
	12532.0	7.92	10.15	7.42	9.26	9.16		
28	1292.0	17.55	-3.00	4.62	20.88	21.70	-39.30	-2.36
	6970.0	71.12	-19.97	-34.32	107.48	119.95		
	10029.0	11.49	15.00	14.88	12.05	10.45		
28	1292.0	25.34	-0.32	8.98	29.74	30.62	-68.98	0.61
	5690.0	160.78	46.23	-54.64	-59.40	-57.03		
	20604.0	23.14	28.05	27.78	24.08	21.88		
29	1292.0	-3.94	-0.47	-0.61	-2.31	-1.50	-7.24	2.33
	11380.0	4.30	4.91	5.25	3.74	3.49		
	10681.0	4.49	6.34	6.34	4.70	3.72		
				Ferritic Steels				
3	841.0	16.07	15.84	13.59	16.91	17.91	-25.75	19.65
	13440.0	11.28	2.70	11.27	12.19	5.35		
	32074.0	0.78	-4.83	4.68	-8.98	2.18		
8	1067.0	16.93	26.14	19.98	16.01	14.94	-0.95	24.81
	14340.0	-11.90	9.27	6.52	0.81	10.57		
	4343.0	1.35	10.79	7.95	0.90	-1.99		

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
8	1067.0	33.10	43.92	36.73	31.98	30.74	7.26	42.41
	12100.0	12.69	19.80	16.32	36.54	46.01		
	6352.0	12.53	24.24	20.03	12.80	9.05		
8	1112.0	27.37	12.22	23.67	28.15	28.87	-32.37	6.32
	10980.0	78.15	5.47	5.44	-41.22	-35.59		
	2598.0	-1.59	1.17	-7.25	3.89	0.91		
9	950.0	-7.28	-9.33	-8.67	-6.69	-6.70	-26.97	-7.53
	7500.0	-35.60	61.17	46.63	-14.99	-14.99		
	27961.0	1268.80	14486.00	32301.80	1643.00	1643.00		
11	1000.0	26.20	26.59	27.73	25.46	24.56	-96.73	-73.09
	31000.0	1.33	-0.71	-6.84	4.15	8.17		
	1865.0	9.94	11.73	11.70	9.41	11.27		
11	1000.0	36.58	37.60	38.54	35.76	34.53	-107.50	-73.09
	28000.0	9.39	7.06	0.13	12.52	16.97		
	2484.3	18.68	21.60	21.44	17.96	20.82		
11	1000.0	56.46	59.48	59.64	55.47	53.24	-145.50	-75.06
	23000.0	25.79	22.84	14.08	29.66	35.03		
	5351.5	35.97	42.15	41.56	34.81	40.43		
11	1000.0	69.55	73.18	73.18	68.48	65.91	-156.70	-73.95
	21000.0	36.57	33.33	23.68	40.82	46.68		
	6114.4	47.49	54.69	53.98	46.19	52.68		
12	1100.0	21.33	40.23	35.65	22.78	7.18	12.71	44.23
	9500.0	15.30	7.65	9.33	22.33	-1.11		
	48202.0	17.34	6.53	13.55	21.52	Note 2		
13	1100.0	63.53	65.69	60.87	65.84	61.40	36.45	48.39
	10000.0	50.04	-16.21	6.89	53.70	30.04		
	32785.0	52.68	11.38	1×10^5	56.57	23.94		
14	1100.0	34.49	29.25	31.18	37.31	31.06	-46.73	2.82
	7000.0	83.42	-44.99	27.76	74.16	-37.53		
	8556.0	Note 2	-39.72	Note 2	Note 2	-8.71		
15	1200.0	25.15	19.51	23.05	25.34	21.93	19.42	25.59
	10000.0	-8.64	40.36	-17.18	22.70	-32.06		
	1850.05	3454.00	29712.00	5203.00	5×10^5	Note 2		
16	1200.0	54.47	36.09	41.52	56.82	58.93	18.76	31.66
	8000.0	-4.18	-24.98	-32.71	34.22	53.72		
	1493.0	6.67	11.64	6.24	7.17	3.93		
18	1200.0	30.44	15.59	24.62	30.59	29.88	-189.99	-59.13
	9000.0	-50.20	-80.92	57.55	-48.68	-36.60		
	6686.0	9.07	20.12	20.53	8.28	13.34		
19	1100.0	9.53	8.97	9.58	9.44	9.45	2.93	5.93
	40000.0	-10.50	-6.02	-6.96	-9.39	-8.71		
	1341.0	-99.94	-3.14	-9.99	-97.20	-87.04		
19	1100.0	34.32	33.77	34.49	34.19	34.16	19.67	27.70
	30000.0	7.07	13.57	12.26	8.70	9.74		
	2734.0	-99.93	22.18	5.99	-96.30	-83.25		

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
20	1600.0	4.73	2.90	-6.67	13.08	10.21	-64.17	8.52
	340.0	-10.93	3.46	8.26	-12.95	-27.72		
	2026.0	-17.26	-20.90	-1.79	-20.21	-11.91		
22	1100.0	30.28	31.04	31.60	30.23	29.01	22.56	40.09
	15000.0	-8.36	-6.31	-11.91	-3.66	-1.62		
	2079.8	-100.00	10608.00	4645.00	-99.88	-69.88		
23	1200.0	11.67	-0.61	2.58	14.04	14.41	-0.48	9.24
	4000.0	-5.67	2.41	0.10	-6.81	-11.92		
	16182.3	4.24	8.10	6.20	4.09	3.69		
24	1200.0	8.55	1.37	0.96	12.71	14.49	-19.54	-1.40
	3000.0	-4.58	-21.41	-7.93	-6.92	-7.80		
	17815.7	3.21	-3.46	-0.36	2.98	0.23		
27	1022.0	-14.48	-1.19	-9.02	-17.35	-17.35	-6.03	4.57
	13940.0	15.57	-5.50	-11.42	24.87	24.85		
	33488.0	47034.00	-3.72	3538.00	Note 2	Note 2		
27	1112.0	18.13	13.34	16.88	18.56	18.54	-13.06	9.80
	8960.0	-21.49	9.81	-31.15	-17.33	-17.34		
	12459.0	73818.00	1879.00	5720.00	Note 2	Note 2		
27	1112.0	37.80	31.43	36.14	38.37	38.36	-13.81	26.75
	7110.0	-9.08	67.37	-21.34	-3.86	-3.87		
	20894.0	93995.00	2447.00	7349.00	Note 2	Note 2		
28	1112.0	-12.40	5.33	10.86	-9.86	-9.87	-10.97	10.68
	11380.0	7.20	-27.13	-29.30	7.19	7.18		
	12846.0	8.03	-0.90	-4.11	4.40	4.39		
28	1112.0	7.44	30.40	37.60	10.72	10.71	6.71	37.36
	8960.0	33.42	-9.94	-12.71	33.38	33.37		
	15486.0	34.58	22.95	18.51	29.84	29.83		
28	1112.0	15.19	45.94	55.85	19.51	19.49	-2.73	55.52
	7110.0	53.48	1.61	-1.88	53.21	53.19		
	36628.0	55.50	40.78	33.61	48.76	48.75		
29	1112.0	10.53	5.66	9.31	10.92	10.91	-47.97	-3.56
	5690.0	30.23	-17.02	-17.33	46.67	46.66		
	26450.0	7.54	4.35	6.16	8.25	8.24		
30	1112.0	6.31	-6.26	2.35	7.96	7.95	-19.69	6.40
	7110.0	-18.59	-14.68	-26.08	13.87	13.87		
	14793.0	18.66	20.20	19.17	18.46	18.45		
31	1022.0	30.60	29.02	29.95	30.85	30.85	10.15	31.08
	11090.0	23.92	34.02	32.92	38.96	38.94		
	10573.0	17.47	19.71	19.70	17.81	17.80		
32	1022.0	27.50	26.02	26.83	27.75	27.73	17.94	24.67
	22190.0	11.73	16.78	16.22	-17.23	-17.24		
	19870.0	16.64	17.83	17.85	16.96	16.95		
				Aluminum Alloys				
1	375.0	24.98	20.04	5.71	24.96	16.40	-2085.00	5952.00

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
1	15000.0	4.31	-25.44	50.31	7.16	3.21		
	905.0	13.86	13.13	7.63	13.80	16.07		
2	500.0	61.37	48.87	42.80	60.83	58.72	47.57	62.79
	6000.0	29.33	21.45	-10.75	23.06	-20.70		
	2309.0	4540.00	-2.89	9832.50	5035.00	12437.00		
3	375.0	12.98	11.25	9.65	12.76	12.65	-4.60	3.41
	23000.0	-4.47	-2.90	-10.40	-2.72	0.15		
	670.9	6.78	8.86	8.60	6.85	7.88		
4	375.0	16.43	9.48	16.50	16.19	11.52	126.99	119.90
	25000.0	2.48	-8.72	-17.75	4.45	4.26		
	537.0	6.03	6.99	4.87	5.55	9.04		
4	375.0	20.82	14.22	21.94	20.82	14.77	157.50	151.90
	23000.0	7.12	-5.62	-15.83	9.13	8.86		
	958.8	11.61	13.32	9.47	10.98	16.57		
5	400.0	18.17	9.54	5.37	19.08	18.92	-20.99	7.62
	5000.0	-28.40	62.73	-8.41	13.03	68.38		
	1609.0	Note 2	0.01	6152.00	-100.00	-11.49		
6	400.0	31.76	23.18	17.11	34.44	33.35	-3.72	24.17
	5000.0	-8.30	-39.03	11.71	25.42	-41.56		
	1827.3	1×10^5	13.71	2698.20	Note 2	-5.12		
7	400.0	19.50	11.59	4.52	22.43	21.79	-17.73	10.71
	5000.0	-8.09	-3.00	2.40	-26.03	27.86		
	1929.8	-1.38	4.46	-0.07	-1.43	2.38		
8	400.0	11.65	22.08	14.40	11.11	-3.78	18.13	19.54
	14000.0	7.10	-7.17	18.72	9.30	23.15		
	741.1	8.87	13.87	848.80	9.44	17.11		
8	400.0	9.74	16.30	9.84	8.81	-3.12	13.58	14.32
	15000.0	2.47	-10.62	1.18	4.47	18.31		
	510.8	4.62	8.38	779.20	5.13	10.78		
10	662.0	9.19	4.65	-3.07	18.23	26.33	-38.77	-7.56
	1100.0	-7.17	46.25	-3.21	-11.36	11.09		
	882.0	2.42	1.33	-0.13	4.68	-5.48		
13	482.0	22.75	17.25	13.90	23.98	19.38	9.65	13.12
	1680.0	34.37	8.97	15.06	-26.14	-17.72		
	2061.0	13.86	12.00	17.56	14.59	19.00		
14	482.0	5.19	-7.93	-12.60	8.19	1.67	136.99	123.50
	4480.0	-45.68	-48.76	-37.06	-43.37	-30.20		
	2258.0	12.45	12.19	13.03	12.71	12.71		
14	482.0	14.79	0.56	-4.80	18.28	10.64	165.59	150.60
	4030.0	-40.68	-41.31	-32.60	-38.06	-23.54		
	2567.0	24.09	23.76	24.70	23.97	24.44		
14	482.0	24.67	9.72	2.32	29.75	18.36	233.71	216.70
	3360.0	-34.55	4.09	-35.02	-31.50	-14.77		
	5220.0	43.64	42.98	44.10	43.48	44.37		
15	482.0	39.15	26.52	-8.48	40.64	31.41	-77.53	-8.62
	3360.0	-43.69	-49.17	-18.86	-34.38	-14.57		

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	4030.0	26.65	34.50	13.52	30.56	33.30		
16	482.0	38.30	41.15	31.95	39.60	17.61	-43.60	-23.15
	4480.0	-25.26	18.79	27.95	-17.42	-0.84		
	1344.0	42.46	42.48	41.63	42.10	44.36		
17	400.0	-12.43	10.47	8.02	-8.54	-28.95	74.19	68.76
	6000.0	-8.56	2.33	-1.50	-7.58	-8.67		
	624.2	10.76	8.76	4.77	9.99	13.00		
21	400.0	16.56	10.89	4.41	17.30	16.06	-10.98	3.20
	4480.0	45.69	43.09	1.38	-30.68	-20.93		
	5120.0	2.85	3.82	-8.85	-0.53	10.08		
24	400.0	15.46	15.07	3.96	15.69	8.44		
	6500.0	23.20	-5.06	13.56	-17.32	-3.47		
	1466.9	954.10	701.20	405.00	1033.00	-58.42		
26	400.0	8.89	8.47	7.81	8.94	8.75	4.29	5.31
	15000.0	5.60	-6.37	3.70	5.53	-1.07		
	553.3	316.30	995.70	416.60	280.90	3800.00		
				Nickel Alloys				
1	1800.0	35.29	20.57	15.37	36.78	37.77	2.65	16.55
	9400.0	-1.33	14.27	16.04	-0.42	12.17		
	1164.2	23.78	25.53	25.45	24.96	23.92		
1	1800.0	52.58	35.45	25.17	57.15	53.50	-53.80	26.72
	6000.0	28.79	15.91	26.47	55.48	-58.24		
	7187.8	49.17	53.28	53.37	52.60	51.37		
2	1600.0	16.69	25.50	18.80	18.84	-88.32	-88.32	-11.52
	11000.0	23.16	-19.64	-7.23	24.66	-57.39		
	6610.3	16.25	16.49	13.35	18.94	14.10		
2	1600.0	17.31	30.50	21.35	20.65	1.36	-181.20	-16.51
	8500.0	147.80	-0.83	-22.69	146.40	-57.11		
	22226.0	26.32	29.81	24.36	29.59	25.88		
3	1300.0	17.71	18.72	17.47	18.26	16.14	1.64	9.91
	44000.0	24.19	7.86	-7.13	31.29	-22.48		
	2870.7	0.01	2.69	-2.21	-4.38	6.63		
3	1300.0	29.52	31.76	29.93	30.40	27.09	4.15	19.77
	37000.0	-27.22	-27.27	20.20	-22.66	-15.43		
	6048.0	0.71	8.45	-12.74	-15.68	16.24		
4	1600.0	9.38	9.30	6.55	10.86	9.31	-13.02	8.47
	16000.0	-3.02	-6.31	2.29	-2.31	-16.04		
	2063.0	-8.47	-7.66	-3.29	-5.71	-10.04		
4	1600.0	8.51	8.43	5.66	10.01	8.44	-14.64	7.61
	16000.0	-4.16	-7.64	1.32	-3.49	-17.75		
	2171.0	-10.02	-9.22	-4.60	-7.18	-11.97		
4	1600.0	16.96	16.87	13.58	18.79	16.86	-16.01	15.96
	14000.0	0.21	-5.57	7.88	0.62	-21.38		
	3157.0	-10.95	-10.00	-2.16	-6.78	-17.32		
4	1600.0	17.53	17.44	14.15	19.34	17.43	-14.89	16.53

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
4	14000.0	0.97	-4.65	8.52	1.40	-20.01		
	3061.0	-9.74	-8.80	-1.22	-5.67	-15.67		
5	1500.0	-5.30	-3.88	-8.75	-1.96	-5.77	-0.71	5.51
	10000.0	-12.32	3.16	0.09	-8.79	-23.61		
	11094.0	1.65	12.84	3.91	3.33	2.13		
6	1800.0	4.82	-2.26	-1.20	6.36	6.50	-14.26	-0.22
	7500.0	-12.89	-19.87	-13.67	-14.00	-20.99		
	1866.0	-11.45	-12.90	-12.97	-11.61	-13.61		
6	1800.0	41.29	32.31	33.91	42.90	43.51	24.45	34.91
	6000.0	22.77	17.90	22.08	22.15	16.65		
	1251.0	24.24	22.42	22.57	23.92	21.86		
8	1500.0	35.56	11.20	1.80	37.71	40.18		
	10000.0	-61.30	102.20	76.37	-55.75	-46.33		
	5413.0	8.89	15.55	10.97	10.39	9.39		
8	1500.0	62.92	33.14	21.11	66.14	68.62	-25.94	-9.15
	8000.0	-54.25	-61.50	138.77	-47.43	-35.86		
	6706.0	32.42	41.58	35.45	34.38	33.19		
13	1292.0	22.43	29.86	28.53	20.14	18.02	-10.02	31.95
	15680.0	19.08	14.91	23.24	16.87	13.44		
	34053.0	20.39	16.09	24.89	17.62	16.08		
13	1382.0	12.86	7.55	8.09	14.39	14.81	-16.21	6.97
	13440.0	-0.72	-5.39	2.15	-3.45	-7.31		
	13089.0	-8.44	-8.95	-6.69	-9.40	-7.21		
13	1382.0	51.05	43.09	43.76	53.52	54.00	-10.47	42.02
	8960.0	25.51	13.64	32.01	18.65	8.86		
	22657.0	-7.25	-5.69	0.33	-18.36	3.24		
15	1597.0	40.58	13.00	5.17	41.22	39.79	5.26	11.74
	8960.0	-4.54	2.13	7.23	15.96	-42.66		
	10438.0	12.52	15.11	14.23	14.76	13.22		
15	1597.0	53.86	22.34	10.63	55.73	49.95	-14.57	18.10
	6720.0	106.95	-11.25	6.93	-52.36	-40.88		
	26153.0	20.49	25.22	22.99	25.17	24.04		
16	1498.0	29.19	-3.39	6.44	33.74	36.75	-90.15	-5.58
	6720.0	10.53	106.60	-53.66	62.66	172.92		
	3343.0	-14.22	-9.23	-16.15	-10.60	-12.48		
16	1498.0	79.30	32.64	46.77	86.51	89.97	-124.50	28.63
	4480.0	101.63	-62.07	5.37	181.76	-56.81		
	5017.0	15.74	24.88	12.66	21.79	19.71		
20	1950.0	-17.65	-14.75	-18.20	-15.54	-22.25		
	10000.0	-6.72	-27.89	-29.55	-29.96	87.90		
	1056.0	-23.93	-23.45	-22.52	-22.47	-25.94		
23	1500.0	33.49	9.32	21.10	36.24	30.28	-14.05	19.96
	10000.0	113.33	28.22	-36.10	125.50	-41.29		
	27711.0	-23.31	7.63	Note 2	-13.45	-0.61		

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
				Cobalt Alloys				
1	1800.0	22.92	23.81	22.59	24.16	20.08	-4.39	15.30
	3500.0	21.42	-4.01	-3.48	22.86	14.04		
	160.0	12.49	4.43	1.82	12.14	5.61		
1	1800.0	9.47	10.71	8.89	11.16	5.40	-52.34	5.00
	3000.0	6.57	69.02	33.95	8.13	-13.91		
	472.04	7901.00	-19.21	-42.11	31446.00	Note 2		
1	1800.0	36.65	37.97	36.08	38.45	32.40	-16.54	29.83
	2700.0	33.96	48.80	7.95	35.78	17.09		
	296.05	1584.00	6.44	-7.30	33940.00	Note 2		
2	1500.0	10.90	13.09	13.78	11.20	12.62	22.74	28.21
	12000.0	17.55	8.74	11.02	16.82	16.54		
	827.0	2.64	8.02	1053.00	619.06	657.55		
2	1500.0	16.83	20.70	21.51	17.31	19.31	28.88	41.06
	10000.0	28.29	10.95	15.55	27.12	26.40		
	1501.0	790.90	21.12	1327.00	793.60	840.90		
2	1600.0	-29.58	-13.88	-16.15	-27.33	-25.25	-10.54	-7.34
	15000.0	-18.53	-21.07	-21.22	-14.85	-18.42		
	819.0	504.70	-10.31	845.90	501.70	533.80		
2	1600.0	-30.87	-11.45	-14.40	-26.68	-25.54	-9.10	-2.08
	13000.0	-15.76	-23.28	-22.36	-17.70	-15.99		
	1655.0	626.20	-2.65	1026.30	621.01	659.15		
3	1800.0	-10.99	-7.08	-12.48	-7.04	-32.32		
	4000.0	18.82	-10.42	-9.65	2.00	-54.60		
	686.0	7.50	-2.11	7.20	8.32	8.77		
4	1500.0	12.90	10.48	3.83	16.49	18.09	-26.91	-11.07
	12500.0	1.91	-25.10	-13.46	5.71	-20.97		
	6188.0	11.88	9.24	4.24	13.71	7.17		
5	1700.0	-14.21	-15.58	-18.62	-12.45	-13.59	0.54	4.65
	10000.0	-22.85	-28.80	-70.12	-20.04	-30.06		
	573.0	-27.78	-100.00	38832.00	-21.65	47107.00		
7	1700.0	8.50	7.29	3.55	13.37	17.91	32.72	67.54
	13000.0	4.67	2.10	6.61	4.90	-1.15		
	935.8	-6.33	-7.31	0.31	-4.62	-22.10		
9	1600.0	2.48	5.85	3.84	2.62	-0.26	-6.59	7.05
	20000.0	-5.81	-2.43	-1.08	-6.15	-15.04		
	996.8	-1.42	-3.90	-1.44	-1.48	-4.49		
9	1700.0	0.33	-5.49	-9.49	2.02	2.44	-14.50	-6.29
	18000.0	-17.38	-13.92	-12.30	-18.61	-37.79		
	323.8	-2.31	-1.90	-2.50	-1.81	-2.47		
11	2000.0	-1.66	0.72	0.08	-0.56	-8.65		
	5000.0	-4.10	4.26	-22.23	-2.81	-29.47		
	753.63	6361.00	Note 2	2×10^5	18273.00	Note 2		
11	1950.0	-12.03	-7.14	-6.94	-11.50	-22.82		
	6000.0	-8.04	-16.09	-15.33	-7.29	-15.51		
	1258.4	-9.45	-14.14	-12.25	-7.82	-10.68		

Table 34. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
12	1800.0	4.98	4.03	0.36	7.69	7.44	-14.63	-0.53
	6000.0	-2.27	-20.70	-16.16	-2.31	-10.58		
	881.0	-15.14	-2.22	-17.04	-18.32	-17.87		
14	1800.0	41.24	26.17	13.15	45.53	46.34	12.24	31.60
	4000.0	-8.68	5.22	15.82	-17.90	114.53		
	1463.5	4.23	10.30	7.78	9.40	9.66		
15	1200.0	24.29	-1.86	2.31	14.83	56.59	7.10	12.87
	75000.0	9.21	-2.57	3.93	3.01	19.79		
	2566.0	0.19	-8.39	-6.91	-4.40	5.36		
15	1800.0	8.51	7.65	-1.92	13.02	7.81	7.91	15.82
	7000.0	-9.55	6.65	3.25	-1.12	-30.07		
	1478.0	4.31	12.79	15.39	8.65	-0.00		
17	1200.0	-6.33	-1.62	-2.74	-5.31	-4.39	4.60	10.43
	35000.0	-35.89	-13.91	-18.95	-31.76	-30.59		
	1538.0	3231.90	-3.12	-25.78	18902.00	7×10^5		
17	1200.0	3.49	10.84	9.10	5.06	6.53	8.21	29.81
	25000.0	-24.08	6.65	-0.49	-18.28	-16.70		
	3986.0	4729.00	23.25	-11.08	27188.00	Note 2		
17	1200.0	43.86	52.73	50.63	45.77	47.33	56.70	75.50
	20000.0	1.73	40.24	31.35	9.01	11.01		
	2600.0	5844.00	60.15	18.19	33625.00	Note 2		

Note 2. Outside stress range of equations to master curves.

Table 35. Average Values of Percentage Deviation of Stress (Equation 23) for Exterior Extrapolation: First Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	15.71	14.13	10.98	16.89	18.04	37.24	16.22
Rank	3	2	1	5	6	7	4
				Ferritic Steels			
Value	25.75	25.28	27.07	26.74	25.52	38.78	29.36
Rank	3	1	5	4	2	7	6
				Aluminum Alloys			
Value	20.70	16.15	11.86	21.93	18.99	63.48	54.47
Rank	4	2	1	5	3	7	6
Value	20.72	16.15	11.86	21.93	18.99	164.55	349.34
Rank	4	2	1	5	3	6	7
				Nickel Alloys			
Value	29.66	19.72	17.62	31.38	29.71	33.68	16.56
Rank	4	3	2	6	5	7	1
				Cobalt Alloys			
Value	16.04	13.46	12.38	16.22	19.69	17.72	21.16
Rank	3	2	1	4	6	5	7
				All Data			
Value	21.82	18.22	16.69	22.89	22.62	38.07	22.78
Rank	3	2	1	6	4	7	5
Value	21.82	18.22	16.69	22.89	22.62	55.41	76.99
Rank	3	2	1	5	4	6	7

Table 36. Average Values of Percentage Deviation of Stress (Equation 23) for Exterior Extrapolation: Second Order Polynomial.

	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels			
Value	31.74	30.96	25.19	28.23	33.14	37.24	16.22
Rank	5	4	2	3	6	7	1
				Ferritic Steels			
Value	22.78	20.47	17.10	24.31	23.82	38.78	29.36
Rank	3	2	1	5	4	7	6
				Aluminum Alloys			
Value	19.83	21.94	16.06	18.48	17.30	63.48	54.47
Rank	4	5	1	3	2	7	6
Value	19.83	21.94	16.06	18.48	17.30	164.55	349.34
Rank	4	5	1	3	2	6	7
				Nickel Alloys			
Value	33.89	24.44	23.21	39.33	36.36	33.68	16.55
Rank	5	3	2	7	6	4	1
				Cobalt Alloys			
Value	14.41	17.50	16.19	13.37	25.88	17.72	21.15
Rank	2	4	3	1	7	5	6
				All Data			
Value	24.82	23.16	19.64	25.11	27.46	38.07	26.78
Rank	3	2	1	4	6	7	5
Value	24.82	23.16	19.64	25.11	27.46	55.41	76.99
Rank	3	2	1	4	5	6	7

Table 37. Percentage Deviation of Rupture Time (Equation 24): Exterior Extrapolation.

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
				Austenitic Steels				
1	1350.0	77.23	65.49	38.81	112.78	124.38	-52.80	9.83
	5800.0	1.87	-42.11	-25.32	-0.53	-30.41		
	30368.4	-36.55	-40.38	-35.17	-45.86	-36.31		
2	1350.0	50.92	73.17	26.49	98.66	93.70	39.60	175.15
	7000.0	74.17	180.90	150.76	85.33	35.34		
	8537.7	35.19	90.09	78.44	38.33	34.96		
3	1350.0	29.09	22.77	2.64	48.74	38.15	2.92	46.27
	8000.0	-3.19	63.96	28.13	-1.65	-18.55		
	12529.1	19.26	79.85	24.66	25.73	26.98		
4	1650.0	-34.35	58.09	15.40	0.73	-0.87	-58.03	223.90
	1000.0	729.06	2119.94	2507.00	620.68	282.63		
	10083.0	228.38	22.83	121.85	189.24	7.15		
4	1800.0	-35.36	148.93	82.67	-6.30	15.82	65.66	347.40
	1000.0	400.84	512.80	433.00	432.61	303.01		
	1833.0	63.31	-10.26	26.62	61.37	-20.80		
4	1800.0	-41.71	470.40	205.20	16.37	52.28	-18.40	1814.80
	500.0	3911.27	8119.00	5992.00	4377.60	1958.90		
	10080.0	-32.76	-94.87	-72.96	50.49	-95.78		
5	1500.0	64.11	118.34	84.05	100.05	123.11	-43.62	-10.60
	3000.0	38.48	-35.49	-27.14	41.20	16.65		
	13145.8	107.94	80.18	71.55	99.97	79.17		
6	1350.0	-16.60	-80.07	-55.30	-13.27	-11.10	-68.45	-70.13
	7400.0	-60.02	-59.41	-60.37	-59.08	-63.25		
	12955.9	-47.08	-52.44	-49.05	-46.10	-48.50		
7	1350.0	162.36	22.56	110.85	179.50	128.70	-22.79	24.06
	5000.0	-55.32	-17.40	-11.23	-58.58	-69.40		
	11960.7	40.96	23.18	9.94	62.24	83.97		
7	1350.0	215.03	28.04	149.30	245.30	157.78	-46.70	28.47
	4000.0	-77.70	-37.96	-27.92	-80.99	-88.18		
	24406.4	111.90	35.78	9.02	182.34	301.50		
8	1350.0	101.90	44.49	6.99	130.59	115.63	-51.13	-11.36
	5200.0	-50.87	-57.37	-43.09	-53.50	-64.66		
	11458.5	-60.03	-56.17	-58.92	-56.66	-57.92		
9	1350.0	15.86	17.67	7.34	28.05	31.20	-46.55	-38.54
	7500.0	0.40	-12.93	-9.38	4.85	-15.59		
	10978.5	0.97	-1.81	4.76	-5.91	1.92		
10	1350.0	29.39	-23.50	-49.23	60.69	43.95	-64.54	-44.55
	6500.0	-66.54	-50.86	-50.01	-65.05	-77.70		
	26405.5	156.68	1089.32	542.03	190.88	187.20		
11	1600.0	18.08	108.60	15.65	71.44	122.80	-82.55	-58.35
	2500.0	-38.30	-85.69	-72.95	-37.00	-60.07		
	12303.8	403.39	336.01	226.91	325.80	224.30		
14	1291.0	105.40	-29.70	9.90	130.23	155.74	-35.12	-11.11

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
14	11200.0	-44.85	-46.38	-35.44	-49.94	-53.50		
	10698.0	22.44	39.82	38.47	33.12	11.86		
14	1291.0	487.90	35.20	147.40	598.40	689.40	-28.97	79.99
	8960.0	-46.00	-48.80	-17.04	-57.60	-65.72		
	25829.0	396.38	644.30	576.60	557.60	301.90		
16	1561.0	599.37	329.70	151.12	1130.60	1107.36	-44.57	332.55
	1120.0	0.97	-12.96	42.92	15.41	-61.68		
	13355.0	599.66	1079.40	555.73	685.32	892.50		
20	1500.0	191.04	209.78	138.30	389.51	436.34	46.83	228.12
	10000.0	190.12	89.65	204.44	217.59	47.77		
	11257.0	217.22	132.22	245.48	188.20	146.30		
20	1500.0	113.65	127.40	74.93	259.34	293.70	7.78	140.87
	10000.0	112.97	39.21	123.48	133.14	8.47		
	15335.0	132.86	70.45	153.60	111.56	80.78		
24	1500.0	92.00	219.46	130.30	153.80	210.20	-56.78	-19.52
	3000.0	16.36	-83.24	-64.88	25.38	-12.58		
	14233.0	746.13	554.10	356.70	807.40	472.80		
25	1500.0	117.26	126.92	74.87	170.79	157.85	-67.18	-58.80
	2800.0	-11.04	-69.16	-66.96	-8.31	-42.32		
	16867.4	34.07	14.42	-7.06	24.22	6.79		
26	1292.0	49.70	35.42	-1.52	80.40	65.33	-64.48	4.15
	5690.0	-29.59	-6.92	11.49	-40.11	-42.91		
	19250.0	1064.00	912.52	749.90	1164.00	1407.00		
27	1292.0	182.45	22.91	85.80	207.32	183.77	-50.63	-31.33
	8820.0	-67.83	-58.92	-53.09	-71.27	-76.96		
	12532.0	71.26	119.39	63.98	95.91	97.20		
28	1292.0	131.41	-11.75	22.20	180.90	191.56	-55.06	-9.46
	6970.0	-73.26	-65.03	-58.08	-77.98	-79.58		
	10029.0	113.48	195.04	188.63	126.57	98.11		
28	1292.0	222.90	-1.29	46.54	313.00	328.70	-68.21	2.58
	5690.0	-85.22	-76.41	-67.81	-89.32	-90.58		
	20604.0	464.70	873.48	812.90	548.09	415.70		
29	1292.0	-17.52	-2.38	-3.03	-10.87	-7.20	-20.93	13.12
	11380.0	30.17	37.95	42.46	24.86	22.53		
	10681.0	32.07	57.29	57.71	34.48	24.49		
				Ferritic Steels				
3	841.0	342.97	347.99	241.17	399.56	426.40	-88.71	1057.10
	13440.0	146.39	15.31	149.02	170.68	38.71		
	32074.0	1.64	-15.64	25.63	-18.58	6.75		
8	1067.0	388.12	1113.40	567.40	340.80	300.30	-4.55	988.74
	14340.0	-24.97	58.62	37.62	-36.47	-45.03		
	4343.0	8.73	113.18	62.91	6.37	-11.88		
8	1067.0	1715.90	4906.00	2505.00	1498.60	1344.00	34.02	4412.30
	12100.0	-29.39	116.04	85.86	-47.70	-56.68		

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
8	6532.0	113.69	408.75	203.04	148.28	80.84		
8	1112.0	982.90	171.73	655.10	1091.00	1150.80	-66.59	62.25
	10980.0	-82.88	-67.22	-65.91	-87.32	-88.13		
	2598.0	-10.40	8.92	-32.42	39.54	7.39		
9	950.0	-37.53	-44.50	-42.33	-35.50	-35.32	-61.38	-37.69
	7500.0	-65.40	-76.20	-73.54	-67.53	-67.53		
	27961.0	-78.47	-77.06	-76.86	-78.27	-78.27		
11	1000.0	1780.90	3860.80	2948.50	1622.00	1165.00	-93.60	-97.51
	31000.0	-90.97	-86.54	-77.68	-92.90	-96.40		
	1865.0	223.90	866.90	698.20	187.70	533.80		
11	1000.0	4996.10	14454.00	9377.10	4538.00	2976.70	-93.70	-97.51
	28000.0	-98.37	-97.13	-92.77	-98.98	-99.61		
	2843.3	1154.70	1×10^4	9324.00	930.50	5721.40		
11	1000.0	3×10^4	1×10^5	68461.00	25316.00	13747.00	-95.38	-97.99
	23000.0	-99.99	-99.97	-99.80	-100.00	-100.00		
	5351.5	7×10^4	1×10^6	2×10^7	49928.00	6×10^6		
11	1000.0	8×10^4	5×10^5	2×10^5	69568.00	34553.00	-95.14	-97.73
	21000.0	-100.00	-100.00	-99.97	-100.00	-100.00		
	6114.4	1×10^4	1×10^{11}	5×10^9	1×10^6	9×10^8		
12	1100.0	317.93	1728.70	1087.00	372.50	56.66	53.63	2231.96
	9500.0	64.67	15.30	31.40	115.40	-19.33		
	48202.0	52.32	16.66	28.46	124.38	-23.58		
13	1100.0	2×10^4	20226.00	10675.00	23818.00	14500.00	270.30	2636.00
	10000.0	1260.00	-51.02	6.41	1621.00	110.01		
	32785.0	1055.45	23.35	-55.39	6117.30	32.46		
14	1100.0	622.75	535.31	537.70	861.99	425.11	-63.29	14.41
	7000.0	-75.67	-84.98	-63.47	-72.33	-94.30		
	8356.0	-76.71	-63.96	-79.06	-86.50	-32.94		
15	1200.0	254.96	202.00	255.90	260.40	171.15	101.01	355.70
	10000.0	-27.56	-46.39	-23.03	-37.64	-59.94		
	1850.0	-63.89	-59.99	-52.09	-61.53	-61.35		
16	1200.0	2034.20	573.90	811.54	2506.00	2746.80	57.53	406.90
	8000.0	-29.79	-71.83	-63.21	-41.19	-48.04		
	1493.0	23.97	91.88	28.28	26.75	12.29		
18	1200.0	236.29	91.79	175.70	248.76	212.50	-83.65	-82.18
	9000.0	-78.94	-67.22	-65.50	-77.58	-87.12		
	6686.0	71.84	834.40	909.60	61.41	169.60		
19	1100.0	117.16	109.69	119.53	115.26	114.99	17.14	47.81
	40000.0	-33.49	-40.35	-39.38	-34.96	-36.41		
	1341.0	-31.68	-26.43	-30.01	-31.65	-31.48		
19	1100.0	1136.60	1127.10	1177.90	1118.16	1105.30	122.01	517.70
	30000.0	-94.02	-97.43	-96.95	-95.08	-95.72		
	2734.0	-90.57	18058.00	65.59	-88.39	-83.25		
20	1600.0	24.68	15.04	-26.13	89.53	60.76	-68.25	53.35
	340.0	-36.19	19.02	60.72	-39.09	-59.46		
	2026.0	-48.49	-47.25	-12.51	-50.41	-40.12		

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
22	1100.0	654.30	915.40	798.50	661.42	553.50	125.80	1225.00
	15000.0	-90.65	-91.46	-87.90	-93.31	-94.92		
	2079.8	-90.25	-96.74	-96.82	-89.11	-76.46		
23	1200.0	82.88	-2.98	13.46	112.31	111.87	-1.61	68.17
	4000.0	-19.00	13.26	0.46	-21.20	-30.26		
	16182.3	26.56	70.75	45.50	25.15	22.61		
24	1200.0	61.88	7.56	5.16	113.02	137.40	-41.57	-6.74
	3000.0	-18.59	-42.84	-26.67	-24.98	-26.49		
	17815.7	20.61	-14.53	-1.79	18.91	1.21		
27	1022.0	-67.14	-10.42	-52.55	-72.37	-72.38	-31.65	59.29
	13940.0	-71.48	-28.60	-60.80	-75.36	-75.37		
	33488.0	-70.39	-19.90	-57.84	-74.88	-74.88		
27	1112.0	205.74	118.10	178.99	215.70	215.60	-30.52	73.67
	8960.0	-78.93	-46.25	-70.22	-82.10	-82.10		
	12459.0	-84.74	-75.60	-83.19	-85.00	-85.00		
27	1112.0	759.04	448.40	660.60	796.20	796.10	-26.34	305.11
	7110.0	-95.00	-60.20	-89.38	-96.57	-96.57		
	20894.0	-98.01	-95.50	-97.86	-97.90	-97.90		
28	1112.0	-50.70	45.95	130.39	-43.91	-43.91	-33.44	126.64
	11380.0	91.32	-82.35	-80.35	89.42	89.38		
	12846.0	113.50	-6.74	-23.79	79.70	79.64		
28	1112.0	46.70	589.94	1223.00	76.36	76.33	21.64	1192.60
	8960.0	1632.00	-94.18	-92.74	1537.00	1537.10		
	15486.0	2201.00	711.70	301.97	1328.20	1327.00		
28	1112.0	112.82	1466.00	3526.20	169.83	169.78	-6.13	3418.30
	7110.0	9204.00	-99.53	-99.32	8155.00	8152.10		
	36628.0	2×10^4	12253.00	2470.20	6250.00	6243.00		
29	1112.0	78.21	34.48	65.67	82.47	82.44	-64.36	-15.80
	5690.0	-63.15	-43.00	-56.59	-65.92	-65.90		
	26450.0	95.34	36.31	64.37	115.80	115.73		
30	1112.0	38.52	-24.43	12.24	52.11	52.09	-40.27	39.20
	7110.0	-58.25	-42.94	-51.38	-61.75	-61.76		
	14793.0	927.50	1293.60	1018.60	901.29	901.10		
31	1022.0	552.78	475.53	519.10	566.50	566.40	32.08	577.80
	11090.0	-28.93	-34.13	-33.51	-36.81	-36.80		
	10573.0	229.90	661.05	636.30	266.60	266.60		
32	1022.0	1571.40	1237.30	1408.90	1638.10	1637.90	183.79	1002.90
	22190.0	-17.55	-22.80	-22.20	-34.31	-34.31		
	19870.0	309.50	640.70	648.90	376.04	376.00		
				Aluminum Alloys				
1	375.0	383.14	500.05	57.25	421.80	147.92	-98.40	-99.45
	15000.0	-97.69	-73.68	-67.57	-97.75	-97.09		
	905.0	1454.00	1007.50	102.70	1579.50	13687.00		
2	500.0	3218.99	1532.10	920.30	3117.20	1898.00	322.79	4386.50

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
2	6000.0	121.40	-99.38	-86.80	55.96	-52.74		
	2309.0	-99.31	-12.58	-99.22	-99.56	-99.44		
3	375.0	317.31	235.98	189.92	311.75	293.74	-23.45	36.00
	23000.0	-88.91	-14.75	-83.70	-89.98	-92.25		
	670.9	311.70	2206.00	1295.00	342.50	702.09		
4	375.0	569.70	260.10	944.60	612.76	218.00	-99.90	-99.98
	25000.0	-94.49	-73.38	-63.50	-94.46	-95.99		
	536.9	205.50	433.85	98.86	167.40	3883.80		
4	375.0	963.76	556.16	2005.00	1088.90	331.02	-99.98	-100.00
	23000.0	-99.32	-92.18	-83.90	-99.40	-99.52		
	958.8	1302.90	5444.00	377.80	1034.00	5×10^5		
5	400.0	186.40	74.39	32.92	211.37	190.80	-41.83	51.37
	5000.0	-42.88	-64.60	-26.08	-51.02	-66.65		
	1609.0	-45.92	0.04	-47.50	-45.40	-35.35		
6	400.0	781.32	391.43	178.40	1083.00	856.80	-11.50	414.80
	5000.0	-20.84	-69.40	90.88	-50.05	-72.84		
	1827.3	-60.97	238.50	-51.08	-60.87	-18.38		
7	400.0	290.30	125.40	31.28	422.60	357.30	-42.60	104.90
	5000.0	-26.24	-47.75	14.78	-42.83	-59.07		
	1929.8	-6.60	40.82	-4.41	-6.86	16.98		
8	400.0	120.99	3637.00	484.90	125.90	-17.21	562.02	1433.50
	14000.0	-99.29	-89.88	-50.27	-99.50	-99.92		
	741.1	251.26	2605.00	-69.70	292.20	1×10^5		
8	400.0	95.21	1450.00	243.10	92.20	-14.39	356.13	674.40
	15000.0	-96.42	-76.13	-38.39	-97.03	-99.29		
	510.8	79.92	459.60	-50.20	94.56	3284.00		
10	662.0	120.30	50.60	-20.89	460.90	976.50	-38.77	-43.40
	1110.0	-39.63	-85.03	-22.05	-50.48	-81.87		
	882.0	24.17	13.86	-1.12	55.78	-33.35		
13	482.0	1310.30	734.70	367.22	1739.80	652.40	113.66	346.80
	1680.0	-69.49	113.30	608.80	-78.71	-95.34		
	2061.0	570.90	272.20	1989.00	717.28	7528.00		
14	482.0	43.30	-45.97	-58.01	86.55	10.81	-99.98	-100.00
	4480.0	-94.53	-79.18	-84.14	-93.67	-97.16		
	2258.0	1113.70	880.59	1037.00	1077.00	1508.68		
14	482.0	166.75	4.26	-27.18	277.00	86.88	-99.99	-100.00
	4030.0	-96.03	-72.89	-77.99	-95.43	-98.49		
	2567.0	2×10^4	11064.00	12234.00	17224.00	34500.00		
14	482.0	379.99	99.64	15.93	683.60	183.47	-100.00	-100.00
	3360.0	-98.94	-76.88	-77.37	-98.83	-99.78		
	5220.0	6×10^6	2×10^6	1×10^6	5×10^6	3×10^6		
15	482.0	1198.00	598.20	-38.51	1553.00	517.70	-81.00	-37.57
	3360.0	-96.80	-92.26	-55.68	-97.74	-99.73		
	4030.0	2608.00	33907.00	200.90	6484.00	26500.00		
16	482.0	655.37	1917.50	650.70	823.40	104.50	-62.33	-62.66
	4480.0	-86.91	87.14	433.00	-87.72	-98.69		
	1344.0	2×10^4	2×10^6	8586.00	15469.00	1×10^5		

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
17	400.0	-59.00	509.13	225.40	-50.52	-80.75	-99.98	-99.99
	6000.0	-99.08	-61.80	-16.54	-98.95	-99.12		
	624.1	4503.50	976.50	140.90	2463.00	1×10^5		
21	400.0	667.80	304.70	64.53	816.68	553.92	-51.03	42.14
	4480.0	-82.05	-80.49	13.72	-85.95	-95.60		
	5120.0	40.63	66.20	-37.60	-5.17	701.80		
24	400.0	1134.90	2739.00	63.05	1436.30	182.83		
	6500.0	-72.03	-98.94	2927.00	-80.29	-99.57		
	1466.9	-99.73	-99.90	-86.10	-99.90	-93.95		
26	400.0	714.62	678.60	508.66	752.13	628.01	99.80	185.92
	15000.0	108.95	-29.94	44.68	91.58	-2.94		
	553.3	-54.28	-56.52	-18.91	-70.47	-32.66		
				Nickel Alloys				
1	1800.0	433.40	178.40	103.05	528.80	453.79	6.82	114.50
	9400.0	-3.24	79.12	110.80	-1.02	-38.55		
	1164.2	327.03	420.10	422.40	400.50	367.27		
1	1800.0	938.50	426.30	204.13	1320.70	886.21	-57.45	225.35
	6000.0	-63.57	76.22	225.70	-65.45	-88.87		
	7187.8	3662.50	5039.00	4647.50	5968.30	6950.97		
2	1600.0	109.83	252.20	141.82	136.90	21.39	-76.30	-37.50
	11000.0	-65.80	-36.90	-20.99	-61.53	-87.06		
	6610.3	181.40	245.50	146.50	239.66	168.63		
2	1600.0	115.20	337.30	169.60	155.50	5.85	-89.79	-49.98
	8500.0	-86.60	-68.11	-49.04	-85.38	-97.03		
	22226.0	571.70	1367.00	587.60	775.80	750.25		
3	1300.0	377.80	536.80	424.10	426.00	282.39	9.11	123.81
	44000.0	-50.14	-35.00	-19.08	-54.63	-78.05		
	2870.7	0.02	17.78	-9.28	-14.89	72.17		
3	1300.0	1095.00	1860.60	1379.10	1291.30	757.13	20.33	365.33
	37000.0	-77.34	-65.87	-43.04	-82.51	-94.91		
	6048.0	3.01	72.47	-23.90	-30.49	361.18		
4	1600.0	77.45	76.60	47.33	97.48	76.50	-33.69	67.91
	16000.0	-12.53	-21.45	12.84	-9.48	-39.17		
	2063.0	-26.97	-25.90	-14.22	-20.92	-39.85		
4	1600.0	68.62	67.81	40.00	87.65	67.72	-36.99	59.55
	16000.0	-16.88	-25.36	7.22	-13.98	-42.20		
	2171.0	-30.60	-29.58	-18.49	-24.85	-42.85		
4	1600.0	172.32	171.16	117.70	211.54	170.15	-35.72	156.95
	14000.0	0.88	-17.11	48.61	2.49	-41.28		
	3157.0	-27.14	-26.29	-8.82	-19.94	-42.47		
4	1600.0	180.86	179.66	124.60	221.30	178.62	-33.71	165.01
	14000.0	4.05	-14.51	53.27	5.66	-39.43		
	3061.0	-24.86	-23.98	-5.96	-17.43	-40.67		
5	1500.0	-29.94	-24.78	-44.00	-13.24	-30.97	-4.51	67.09
	10000.0	-51.40	33.55	0.74	-42.33	-65.42		

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
5	11094.0	16.80	592.60	46.58	38.45	23.60		
6	1800.0	28.37	-10.83	-5.79	40.61	39.84	-33.81	-1.14
	7500.0	-37.01	-43.01	-38.01	-37.88	-44.44		
	1866.0	-35.97	-37.65	-37.36	-35.02	-38.49		
6	1800.0	525.20	307.60	323.28	620.19	583.98	76.11	359.36
	6000.0	95.02	49.69	88.27	83.92	45.17		
	1251.0	103.66	98.08	95.27	107.63	90.73		
8	1500.0	454.80	69.58	8.04	589.80	558.50		
	10000.0	-83.27	-77.81	-76.83	-84.06	-89.16		
	5413.0	98.97	474.50	172.30	131.46	115.28		
8	1500.0	1483.10	315.53	128.90	2040.40	1746.10	-35.88	-26.19
	8000.0	-87.80	-80.76	-77.79	-89.38	-94.34		
	6706.0	1331.70	19000.00	3464.00	1825.00	1758.87		
13	1292.0	178.60	293.40	275.70	147.20	125.56	-19.15	354.80
	15680.0	104.20	59.49	150.80	73.81	51.30		
	34053.0	86.30	53.38	130.60	63.60	48.66		
13	1382.0	79.04	39.49	42.60	94.10	97.04	-30.87	35.37
	13440.0	-2.40	-14.40	8.30	-10.03	-18.17		
	13089.0	-20.18	-21.88	-17.06	-21.80	-21.40		
13	1382.0	628.70	415.20	423.80	728.40	732.76	-14.69	384.20
	8960.0	92.55	29.96	160.90	49.54	16.80		
	22657.0	-6.01	-6.54	-0.22	-9.64	1.06		
15	1597.0	387.70	71.42	21.55	430.87	302.80	12.45	55.10
	8960.0	-33.02	5.65	25.69	-35.64	-59.51		
	10438.0	62.11	87.27	76.31	87.75	75.70		
15	1597.0	642.20	143.36	47.91	751.83	431.73	-21.62	93.05
	6720.0	-66.81	-19.29	22.05	-71.02	-87.70		
	26153.0	20.49	205.20	153.40	219.50	234.02		
16	1498.0	281.20	-14.64	33.53	404.80	424.00	-75.26	-21.50
	6720.0	-74.04	-80.86	-69.58	-77.36	-85.59		
	3343.0	-43.53	-35.02	-46.72	-36.91	-42.29		
16	1498.0	2012.90	265.45	482.60	3116.90	2884.00	-72.37	189.00
	4480.0	-72.20	-86.22	-60.55	-80.20	-92.02		
	5017.0	78.64	217.55	57.33	142.53	136.56		
20	1950.0	-55.11	-56.80	-60.96	-53.42	-60.16		
	10000.0	-79.80	-71.59	-74.20	-77.04	-82.51		
	1056.0	-76.56	-76.09	-74.41	-74.61	-80.25		
23	1500.0	364.10	61.22	178.95	479.10	251.39	-29.11	179.50
	10000.0	-79.89	-66.04	-54.40	-81.80	-94.87		
	27711.0	-50.99	63.13	-61.90	-38.02	-3.14		
				Cobalt Alloys				
1	1800.0	128.55	138.37	124.30	142.10	100.55	-8.22	86.23
	3500.0	109.56	-4.57	-5.06	120.87	42.91		
	160.0	22.28	11.50	3.66	16.11	7.13		
1	1800.0	43.67	51.26	40.18	54.06	22.15	-58.79	23.78

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
1	3000.0	27.04	-62.45	-60.59	34.39	-28.79		
	472.0	-49.29	-43.96	-53.21	-55.87	-56.36		
1	1800.0	249.39	270.22	239.50	277.80	190.71	-22.21	212.70
	2700.0	200.00	-36.49	-30.27	218.35	44.72		
	296.0	-12.20	18.16	-11.06	-29.10	-24.85		
2	1500.0	10.90	86.97	93.47	63.44	76.63	141.93	451.10
	12000.0	180.70	37.18	55.45	160.95	148.77		
	827.0	3.06	99.13	-26.18	-6.51	-8.19		
2	1500.0	103.74	160.38	170.63	109.41	132.83	154.70	961.98
	10000.0	445.60	41.49	76.68	380.40	332.04		
	1501.0	-46.50	1181.50	-68.97	-55.91	-57.42		
2	1600.0	-78.28	-59.82	-63.69	-77.19	-75.14	-50.10	-45.67
	15000.0	-70.50	-67.25	-68.52	-64.13	-69.64		
	819.0	-74.47	-60.92	-71.55	-73.43	-73.68		
2	1600.0	-79.96	-52.38	-59.09	-76.23	-75.60	-40.50	-15.49
	13000.0	-66.20	-67.51	-68.42	-69.16	-65.57		
	1655.0	-81.11	-27.86	-80.50	-80.70	-81.10		
3	1800.0	-20.89	-22.21	-33.04	-15.48	-40.39		
	4000.0	-56.19	-27.40	-27.32	-52.77	-70.56		
	686.0	47.55	-8.33	43.91	56.26	64.30		
4	1500.0	161.44	127.50	30.47	280.64	243.00	-59.30	-44.93
	12500.0	12.93	-51.83	-44.27	47.73	-52.57		
	6188.0	180.96	128.90	36.70	244.10	73.58		
5	1700.0	-56.79	-58.54	-62.99	-53.60	-55.56	3.92	51.59
	10000.0	-65.66	-66.67	-70.12	-62.55	-67.82		
	573.0	-65.61	-67.21	-68.87	-62.35	-67.50		
7	1700.0	84.65	81.00	27.29	202.90	263.89	322.80	7245.00
	13000.0	37.27	13.50	78.71	41.81	-5.57		
	935.8	-24.40	-25.53	-1.57	-20.03	-37.95		
9	1600.0	21.88	59.43	34.72	23.40	-1.95	-29.18	83.63
	20000.0	-27.62	-13.45	-6.89	-27.45	-46.32		
	996.8	-11.71	-28.10	-11.97	-11.97	-31.89		
9	1700.0	2.56	-33.77	-48.26	17.67	20.85	-50.70	-36.25
	18000.0	-57.00	-52.90	-51.80	-57.03	-63.71		
	323.8	-19.79	-17.10	-21.06	-16.18	-21.10		
11	2000.0	-7.93	3.91	0.45	-2.82	-31.46		
	5000.0	-16.63	-48.20	-42.96	-11.97	-44.57		
	753.6	-45.73	-49.59	-46.10	-49.41	-46.12		
11	1950.0	-47.53	-33.23	-32.53	-46.39	-66.10		
	6000.0	-32.86	-36.24	-42.03	-30.44	-40.59		
	1258.4	-28.01	-35.05	-34.50	-21.10	-40.72		
12	1800.0	35.72	29.30	2.12	64.56	56.91	-40.30	-3.02
	6000.0	-11.32	-50.50	-42.60	-11.23	-34.44		
	881.0	-38.89	-13.60	-43.13	39.60	-43.20		
14	1800.0	718.80	335.90	92.42	1117.13	783.21	42.27	830.90
	4000.0	-21.78	21.70	123.60	-32.55	-75.36		
	1463.5	17.56	60.33	31.15	50.34	60.29		

Table 37. (Contd.)

Cd	A	L-M	M-H	S-G	M-S	S-D	C	K
15	1200.0	315.66	-11.67	23.48	109.52	627.59	64.90	212.63
	75000.0	113.99	-16.00	39.34	22.70	333.42		
	2566.0	2.17	-52.35	-54.73	-32.63	80.02		
15	1800.0	48.17	46.61	-8.22	92.41	39.54	39.29	159.13
	7000.0	-29.30	38.80	17.10	-4.47	-56.10		
	1478.0	25.73	118.12	182.49	62.69	0.01		
17	1200.0	-23.14	-6.92	-11.24	-20.01	-17.03	17.41	71.70
	35000.0	-72.96	-80.59	-78.23	-74.69	-74.54		
	1538.0	-79.37	-21.81	-60.40	-78.41	-76.58		
17	1200.0	14.81	56.99	45.37	22.42	30.21	22.68	314.20
	25000.0	-95.20	-99.29	-98.71	-96.43	-96.61		
	3986.0	-98.98	3282.00	-53.10	-98.58	-97.92		
17	1200.0	331.93	540.20	481.33	368.02	406.20	209.50	2041.00
	20000.0	-97.55	-99.93	-99.79	-98.56	-98.71		
	2600.0	-99.90	4×10^6	284.70	-99.78	-99.53		

CHAPTER VI

CONCLUSIONS AND DISCUSSION

Correlation of All Data

As regards the seven different correlation methods considered in this thesis, it would appear that there are several considerations or conclusions which are logical, but which must never-the-less be ultimately compared with calculated results. Between the Larson-Miller, Manson-Haferd, Sherby-Goldhoff, Manson-Succop, and Sherby-Dorn methods, which are the five methods containing parametric correlation terms not involving temperature dependent terms, it would appear that if other factors were equal that the Manson-Haferd and Sherby-Goldhoff methods would enjoy advantages since each of the involved parametric correlation terms includes two constants while the other three terms have only one apiece. For these five methods it would appear logical for the degree of correlation to improve as the order of the polynomial approximating the master curve is increased. Comparisons made by logic between the mentioned five methods and the Conrad and Korchynsky methods are difficult: while it is true that the latter two methods each involve only one constant for a given set of data, it is also true that there is a temperature dependent term in each. Also, the very nature of the Conrad and Korchynsky methods demand that the master curves be linear, and there is thus no counterpart of the utilization of higher order approximations to master curves.

Particular attention should be paid to the degree of correlation obtained by considerations of the "Standard Deviation of Regression"(Tables 4-8) since it is this quantity which is minimized by the various computer programs. Studies of Tables 4, 5, and 7 will show that obtained values of the standard deviation of regression are indeed reduced as master curves are represented by increasingly higher order polynomials, for the case of those five correlation methods not including temperature dependent terms. Tables 5 and 6 show that when master curves are represented by second order polynomials, where applicable (recalling that the Conrad and Korchynsky methods at the master curve stage can only be represented by first order ploynomials), that there is remarkably little to choose between the seven considered methods. The Goldhoff-Sherby and Manson-Haferd methods give consistently good results, but the Conrad method actually gives the best degree of correlation the maximum number of times: unfortunately, the Conrad method is inconsistent as there were also 38 times out of 129 considered data sets when it gave the sixth best and worst values of the standard deviation of regression. There appears to be no parallel between performance of the Conrad method and the metallurgical type of alloy being considered: unusually good or unusually poor values of the standard deviation of regression were not limited to simple solid solution hardened or precipitation hardened alloys.

When the degree of correlation is measured by values of the standard deviation of regression, and when applicable master curves are approximated by third order polynomials, then study of Tables 7 and 8 shows that the Sherby-Goldhoff and Manson-Haferd methods give

somewhat superior results, while the Conrad and Korchynsky methods generally give inferior results. Stress-rupture data obtained with aluminum alloys is the most difficult to correlate, no doubt due to the fact that the majority of experimental data is obtained at quite high stress levels and low temperatures, resulting in the fact that isothermal lines on plots of the type of Figure 2 tend to have unusually small or low values of slope.

When "Average Deviation of Stress", as defined by Equation 25, is used as a measure of the abilities of the master curves to correlate data, as was done to obtain Tables 9-13, it is found that when applicable master curves are represented by second order polynomials, that average values between 4.97 and 6.71 are obtained, regardless of the correlation procedures being considered. When third order polynomials are used to represent master curves, there is then some definite superiority of the Sherby-Goldhoff and Manson-Haferd methods, and inferiority for the Conrad and Korchynsky methods (Tables 12 and 13).

Comments generally similar to those of the previous paragraph may be made as regards the "Average Deviation of Rupture-Time", Tables 14-18, "Square Root of Adjusted Mean Square", Tables 19-22, and "Square Root of Mean Square Error", tables 23-26, when concerning the abilities of the seven considered methods to correlate data: when second order polynomials are used to represent applicable master curves there are no great differences as regards the correlation procedures used, while the Sherby-Goldhoff and Manson-Haferd methods give superior results when third order polynomial approximations to master curves are involved.

Table 27 shows that there is indeed some justification for prefering the Sherby-Goldhoff and Manson-Succop methods even for the cases of second order polynomial approximations to master curves, and the relative abilities of these two methods to correlate data becomes more distinct when applicable master curves are represented by third order polynomials.

As regards the correlation of all data, there is much to be said for the abilities of the new Sherby-Goldhoff method: it generally gives results which are competitive with the Manson-Haferd method, and which are superior to those obtained with other considered methods.

Internal Extrapolation

As regards the percentage deviation of stress, Tables 28 and 29 show that average deviations between 7.98 and 8.85 percent result from use of any of the five correlation methods involving no temperature dependent terms, but somewhat higher deviations are obtained when the Conrad and Korchynsky methods are utilized. When applicable master curves are represented by third order polynomials, there are then but slight improvements in values of the percentage deviation of stress, as comparisons of Tables 29 and 30 show. When master curves are represented by third order polynomials, average values of percentage deviation of stress given by utilization of Larson-Miller, Manson-Haferd, Sherby-Goldhoff, Manson-Succop, and Sherby-Dorn methods are very competitive, and are distinctly superior to average values of percentage deviation of stress resulting from applications of Conrad and Korchynsky methods. The Conrad and Korchynsky methods are not able to

successfully extrapolate as many data points as the other five methods, since extrapolations can only be made by the former two methods when there are at least three other data points at the same temperature of test as the data point being extrapolated.

When considering the percentage deviation of rupture-time, it is recommended that the Conrad and Korchynsky methods not be utilized for internal extrapolation: Table 31 shows that in several cases unusually large errors are made. For the case of second order polynomial approximations to master curves for the five applicable correlation procedures, the Sherby-Dorn technique is superior. When third order polynomials are used to approximate master curves, the only procedure which is not competitive is the Sherby-Goldhoff method, as Table 33 indicates. Comparisons of the results listed in Tables 32 and 33 with those of Tables 29 and 30 show that the stress values may be more successfully extrapolated than can rupture-time values, due to the small values of slope of plots such as Figures 2 and 4.

Exterior Extrapolation

The whole subject of exterior extrapolation to plotted master curves is one which must be approached with extreme caution, regardless of the correlation-extrapolation procedures being utilized, and regardless of whether stress values are being extrapolated for known values of temperature and rupture-time, or whether rupture-time values are being extrapolated for known values of stress and temperature. Unusual problems may be presented when master curves are approximated by polynomials of the third degree: as Table 34 shows, ridiculous values

of the percentage deviation of stress may then be obtained, due to the fact that the third order polynomial may considerably change values of slope over the extrapolation, or may never be able to actually make the extrapolation at all. Tables 35 and 36 show some slight superiority for the Sherby-Goldhoff and Manson-Haferd methods when first and second order polynomials are approximated to master curves: the Conrad and Korchynsky methods are definitely inferior. The situation is worsened when exterior extrapolations are made and percentage deviations of rupture-time are calculated, as Table 37 shows. The situation is so bad, in general, that no average values can reasonably be obtained to allow comparisons of results between the seven competing methods.

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